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Food Manufacture

Incorporating Canning, Packing, and Preserving

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Food Supplies.

A FEW weeks ago Dr. Levinstein declared that if every inhabitant of the world ate what we call three square meals a day there would be an alarming scarcity of food. It is interesting but rather useless to indulge in such speculations. The fact that, if every Chinaman used a cotton pocket handkerchief instead of a paper one, all the mills in Lancashire would be working full time, does not bring any help or satisfaction to our cotton trade. Years ago Sir William Crookes prophesied a world shortage of wheat and we now find ourselves with a surplus.

We do not know what Dr. Levinstein means by a square meal, but we feel confident that the world's natural resources, aided by the food industries, would produce all the food that the inhabitants of the earth required, and more. Scientific storage and transport of food, fumigation of stores and warehouses to eliminate the ravages of insect pests, a more complete understanding of food values—these and many other factors are preventing waste of food, and it is our belief that the scientific preservation of foodstuffs will go far in the future to avoid the necessity of further production.

But the world has still room for more food production. A few years ago, relatively, much of Africa was a malaria-ridden swamp; now we get choice foodstuffs from what was once a waste, and there is plenty of room for further progress. The increase in the wheat-growing belt of Australia is a modern example of making the wilderness blossom; the desert has been turned into farm land by scientific irrigation and fertilisation. No, let everyone living have his three square meals a day, with afternoon tea thrown in, if you like. There is no fear of famine. Science and the food industries will see to that.

Cream Sterilisation.

The preparation of a sweet, sterile cream put into small containers, to be used for retail trade, offers certain technical difficulties. The subject has been dealt with in an able manner by B. H. Webb of the research laboratories of the U.S. Bureau of Dairy Industry in the *Jour. Dairy Science*, vol. 13, No. 3.

Sweet cream containing 20 per cent. butterfat will withstand a sterilisation temperature of 120° C. for 90 to 140 minutes before coagulation. To prevent separation of fat during long periods of storage, however, cream must be homogenised at relatively high pressures.

The main conclusions reached by Mr. Webb as a result of his studies are that a sweet, sterile cream is best prepared by preheating a cream containing 20 per cent. butterfat to 80° C., homogenising at 3,000 pounds pressure, cooling, placing in bottles of the soda-water type, and sterilising at 118° C. for 12 to 14 minutes. It will keep indefinitely without a seriously objectionable change in flavour or separation of the butterfat.

Colloid Chemistry.

The important rôle played by colloid chemistry in industry is brought home to one by a glance through the list of technical applications which form the subject matter of the recently published fourth volume of Jerome Alexander's monumental work. If one takes into consideration also the technical applications dealt with in the third volume, one is still more impressed by their extraordinary diversity.

In this fourth volume of Alexander we notice that the section on "Butter and Margarine from the Standpoint of Colloid Chemistry" has been contributed by Dr. William Clayton, who is well known as one of the leading authorities in this country on the subject of colloids.

Dr. Clayton points out that butter and margarine are solidified emulsions. Most of the phenomena involved are concerned with the effects of surface tension (air/liquid) and interfacial tension (fat/milk serum).

Growers and Canners.

There was a lively discussion following Mr. H. V. Taylor's paper on "Fruit and Vegetables for Canning and their Production," read at a meeting of the Farmers' Club on October 31 and abstracted in last month's FOOD MANUFACTURE. The financing of the growers and the fixing of contracts were the main questions of contention. The position from the canner's point of view was well stated by Mr. Alfred Woodall. "The way things are tending at present," said Mr. Woodall, "indicates that there is a danger that, with the shortage we see of the supplies for the canners, the growers may force the price up to a height which will make it impossible for the English canner to can his product and turn it out in competition with the foreigner, in spite of the tariffs which have now been put on. In that case it will not only be the canner who will suffer, but it will be the grower who will suffer also. There is certainly a price at which growers can grow fruit and vegetables and which will show a fair profit, and we as canners only ask that the growers shall co-operate with us by long-term contracts at fixed prices, so that this new industry shall be given a fair chance to flourish."

The Grower's Viewpoint.

The grower's viewpoint was ably expounded by Sir William Lobjoit. "What I suggest to the canners," he said, "is that they should point out to the capitalists that for the salvation of their own capital, and as a very good investment for the future, growing for canning is an opening. It implies a completely new development of cultivation. . . . The canners will never get the regularity of supply which they want, or the class of produce which they want, so long as they are dependent upon the surplus from farmers who grow primarily for the fresh market. They will have to get established and organised farms which will specialise on growing for canning. It is being done."

Dairy Yeasts.

In the routine examination of milk, cream, and butter, M. Grimes and J. Doherty have isolated two types of yeasts which ferment lactose with gas formation and produce slight acidity in milk (*Sci. Proc. Roy. Dublin Soc.*, 1929, May, p. 261)- They are non-sporing, and appear to be identical with *Torula lactosa*, Harrison, and *T. cremoris*, Hammer, isolated from cheese and from cream respectively.

Ripening of Raspberries.

Last month, Theodore Rendle read a paper before the Society of Public Analysts recording his observations on changes in raspberries after picking.

The ripening process in raspberries is more rapid than in most fruits. Accompanying the ripening there occurs the production of a relatively large amount of volatile organic bodies not due to the action of micro-organisms. The pectic substances in raspberries are subject to rapid change, with the destruction of their gelling power; this change is arrested by the application of heat. It is suggested that the enzymic activity of raspberries is greater than in most British fruits, and is responsible for these phenomena.

Frozen Orange Juice.

At the New Orleans meeting of the American Chemical Society last March, M. A. Joslyn of the University of California discussed the problem of preserving orange juice by freezing. He said that before a complete solution of the problem can be attained, a more detailed study of the constituents of the orange will have to be made. The gross chemical analysis, although it is of some value, is not sufficient to account for the changes. The rôle of variety, maturity, and growing characteristics of the fruit, of treatment prior to freezing, and of freezing method was discussed. Oxidation appears to be the principal cause of deterioration in frozen orange juice, and it can be almost completely eliminated by de-aeration of the juice and handling under an atmosphere of inert gas. The commercial application of this method is feasible and yields a satisfactory product.

Dough Mixing.

In one of the issues of the *Arkady Review*, E. B. Bennion (joint author with James Stewart of *Cake Making and Small Goods Production*) deals at some length with the mechanical mixing of dough. The primary need is to obtain a thorough distribution of all the ingredients and a development of the gluten after the flour particles have all been completely wetted by the liquid used in the making of the dough. Bennion has carried out experiments on mixing at high and low speeds. The general conclusion reached, at this stage, is that while over-mixing does not entirely destroy the property of a flour to produce a good-volume, well-risen loaf, it does very seriously affect the stability of a dough, making it impossible to produce satisfactory crusty bread of the type of oven-bottom cottage, although pan cottage may be produced fairly successfully. The texture of such loaves is not always satisfactory, however. Further, these experiments demonstrate in some way the possible damaging effects of dividers on doughs which have not been previously fermented suitably.

Fish Sausage.

A special appeal to persons of the Catholic faith has been made by a fish and oyster firm of Seattle, who are making a fish sausage prepared from salmon and cod, which is smoked, spiced, finely ground, and

stuffed in cellulose casings. The development of this sausage has entailed experiments extending over a considerable period of time. The firm in question states that "Some people feel that a fish sausage should be distinctly fish in its flavour, but our study of consumer reactions inclines us to the opposite belief—namely, that the majority of consumers are happy to find a true sausage or bologna which at the same time possesses the fundamental characteristics of sea food."

Frozen Fish.

It is reported that the Halifax station of the Biological Board of Canada has been experimenting for some years past with the rapid freezing of different varieties of fish, and the results have been quite up to expectations. As early as January, 1929, rapid-frozen "ice fillets" were placed on the Toronto market and met with a splendid reception on the part of the consuming public.

This summer, fish from Eastern Canada were frozen and successfully marketed in Ontario.

Fish caught early in May, and of prime quality, were frozen at the Fisheries Experimental Station, Halifax, N.S., and stored at zero Fahrenheit at the station. Over a month later the fish were shipped to two hotels, one in Eastern and the other in Western Ontario. Both consignments were packed in dry ice to ensure proper refrigeration during transit, and the hotel managers in both instances expressed themselves as highly pleased with the shipments.

One hotel manager stated: "The quality of this fish, covering all kinds sent, was absolutely perfect. The meat was firm, the juices were intact; in fact, we in this country have never tasted as perfect fish as what you shipped us."

The fish used for the demonstration consisted of halibut, haddock, scallops, lobsters, and clams. The halibut and haddock were frozen in the "ice fillet" form, as were some of the scallops. The remainder of the scallops, the shelled meat from the lobsters, and the shelled clams were frozen in metal cans containing about one pound each. From one-half to one hour was required to freeze each product preserved.

Fish Developments.

At the Pacific Experimental Station at Prince Rupert, B.C., a method has been developed for preparing a strong glue from the waste liquors obtained in reduction plant operations.

Further work recently carried out at this station includes the following:

It has been shown that several British deposits of diatomites and bentonites can be economically used to decolorise fish oils, a discovery of value in connection with the possible establishment of refineries, since decolorisation is an important process in refining.

Valuable data were accumulated bearing on the use of pilchard oil in the protective coating industry.

Experiments in regard to the nutritive value of canned salmon, including vitamin A and D potency.

Investigations as to the use of waste liquors from pilchard reduction plants as fertilizer.

The characteristics of marine bacteria and their relation to the spoilage of fish, and the effect on the growth of marine bacteria at low temperature of the sodium chloride treatment, which had been found so efficient in the treatment of fresh fish. In this study it was found that halibut treated with a 20 per cent. brine solution and kept in cold storage for eighteen months was in good condition at the end of that time.

Fumigation.

We have made repeated reference in these notes to the need for fumigation, and have from time to time published articles dealing with fumigation methods. It was with particular pleasure, therefore, that we went to the Sessional Meeting at the Royal Sanitary Institute on November 8 to listen to a discussion opened by eminent authorities on the fumigation of ships and the control of insects on foodstuffs and other raw materials by fumigation. Professor Munro in a clear and interesting manner outlined the problem from the entomological aspect, and pointed out the many pitfalls which awaited the unwary investigator in this field of research. His keynote seemed to be to study the idiosyncrasies of the insect and then attack it. He also stressed the fact that what does for one insect may be useless for another. The flour moth may need a totally different dosage from the flour beetle. He told us the interesting fact that one of his assistants had isolated over 400 different species of insects of twenty-five different families in certain cocoa warehouses.

Dr. Page gave an interesting account of the chemical and physical aspects and outlined the valuable work that is being carried out at the Biological Field Station at Slough. He also demonstrated a very ingenious gas sampler. Much of the cost of this research has been borne by the Empire Marketing Board. The practical methods of fumigating ships were dealt with by Mr. Harmer of the Orient Steam Navigation Company. We recommend the careful perusal of these three papers, when they are published by the Royal Sanitary Institute, to all readers interested in fumigation.

Unsalted Butter.

It is well known that unsalted butter which has been kept for a month or two in cold store, such as in transport from the Dominions, very frequently

deteriorates rapidly in flavour when it is again exposed to normal atmospheric conditions. It has been suggested that possible causes of this deterioration are direct oxidation due to contact with the air and the action of micro-organisms. The whole matter has been investigated by J. T. Minster, and an account of his work appeared in the October, 1932, issue of *The Analyst*. He concluded that the onset of the first stages of deterioration of unsalted butter, when exposed to normal atmospheric conditions after a month or two in cold store, could not be correlated with the oxygen absorption; and that the average of the catalase, reductase, bacteriological, and incubation tests was the most reliable guide to the keeping quality of a sample of butter. Low catalase, reductase, and bacteriological test values are characteristic of butter that has gone "off," and these low values develop most rapidly in samples with original subnormal values.

Pigs and Pigheadedness.

At last the long-awaited Report of the Reorganisation Commission for Pigs and Pig Products has been issued. The report is extremely complicated, but one thing seems to emerge clearly, and that is that, for better or worse, bacon curers will have to give up any claims to liberty. It is proposed to ensure, through the marketing policy outlined in the Report, such a price for pigs as will enable the producing industry in Great Britain and Northern Ireland to expand, to make us, if not self-sufficing, at any rate less dependent on outside supplies. The recommendations are based on expanding production by guaranteeing a market and eliminating uncertainty in prices. The proposal is to do this by limiting imports, restricting internal production if necessary, and by fixing a basic price for pigs which vary according to the price of feeding stuffs.

Pig Officialdom.

That some reorganisation is necessary is evident from the fact that in February, 1930, the price of a bacon pig of 140 lb. dead weight was 137s., whereas in December, 1931, it was only 63s., but the machinery proposed to secure the suggested correction seems very complicated—unnecessarily so, and involves yet another bureaucracy which will only lead to confusion. There will be a Quota Advisory Committee, a Pig Marketing Board, a Bacon Marketing Board, a Pig Industry Development Board, separate Boards for Northern Ireland, and a Permanent Reorganisation Committee for the whole industry. It will probably be also necessary to have a school where the proposed officials will be taught the rudiments of their jobs. One would have thought that the lessons learned during the war, particularly in regard to food control, would not have been forgotten so soon. We learned then that each group of commodities must be under one controlling authority with subordinate committees not under competing bodies. The proposals have all the defects of piecemeal control, and if put into effect we can see the pig industry getting still further in the mire, and the poor consumer of bacon having not only to subsidise the pig producer (which he might do gladly) but also to maintain in comfortable jobs a mass of unnecessary officials.

National Mark Jam.

We understand that at a meeting of the Federation of Grocers' Associations it was reported that the Retail Grocers' Advisory Sub-Committee of the Empire Marketing Board had discussed the question of applying the National Mark Scheme to jams. It was not suggested that the present voluntary system of labelling jams in accordance with the Full Fruit and Lower Fruit Standards be interfered with, but it was desired to explore the possibility of giving the highest grades of British jams the special badge of the National Mark.

In spite of many official statements to the contrary, we are informed by those in the trade that the National Mark scheme has not done much to further the sale of English flour. In this case the standards of quality allowed are lower than would be the case in a normal flour—one would seldom get a straight-run Australian flour with an ash content of over 0·45, but the National Mark scheme allows an ash up to 0·55, presumably to allow some country millers who do not know their job thoroughly to have a market for their lower grade flour.

If the application of the Mark to jam will safeguard the public further we shall be pleased.

Telephone Games.

One of the most entertaining features of the recent exhibition of canning plant, held in Birmingham in conjunction with the Imperial Fruit Show, was provided by the telephone arrangements at the various stands. We understand that when the exhibition opened there were prospects of occasional dull moments. Fortunately, the telephone people stepped in with admirable promptitude and very soon exhibitors were thoroughly enjoying themselves in an exciting game of "hunt the number." We have no doubt that this happy inspiration came to the telephone officials in almost a flash. In trying to think of some means of relieving boredom, they would eventually hit upon the familiar Xmas game of "hunt the slipper." The application of this idea to telephones was a simple matter and, indeed, was highly successful. It is unfortunate that some exhibitors, presumably not in the secret, lost their tempers and consequently failed to derive the full measure of innocent fun to which they were entitled.

Citrus Juices

By Professor W. V. CRUESS
University of California

IN RECENT years true citrus beverages have increased greatly in popularity in America, largely at the expense of the imitation fruit beverages. Several causes have been responsible for this change in popular preference. First and foremost among these causes has been the dispensing of orange juice direct from the orange to the customer at many thousands of orange juice counters. More about this later. A second factor has been spreading, in the knowledge that citrus juices are rich in vitamin C, the anti-scorbutic vitamin, and in vitamin A, valuable for growing children and in combating colds, influenza, etc.

Recently it has been shown that the consistent use of a generous amount of orange juice maintains the teeth in healthy condition and prevents tooth decay. It is generally known also to the majority of orange juice consumers that orange juice counteracts the acidosis resulting from acid forming foods such as bread, meat, rice, eggs, and cereals. But above all is the most powerful inducement to the widespread practice of serving the American customer absolutely fresh juice pressed from the orange while the customer waits for his drink.

Fresh Orange Juice.

The California Fruit Growers' Exchange is one of the oldest and most successful of this State's grower co-operatives. Its first duty is to market the boxed fresh oranges to the best advantage. A second duty, well performed in recent years, is the disposition of the surplus fruit and the fruit that is not quite good enough in appearance to qualify for packing in boxed form. The principal outlet for this fruit is as "juice oranges," utilised in soda fountains, juice stands, and eating establishments, in preparing fresh juice. Some juice oranges are also sold for use in the home.

In juice dispensing stands the juice is "reamed" from the halved fruit by a rapidly revolving cone. These juice extractors are sold at cost in order to stimulate the installation and the use of oranges for juice.

In most cases the juice is dispensed in unsweetened form, the juice flowing from the extractor directly into the glass in which the drink is to be served. In some cases it is diluted with carbonated water, and in others the juice is prepared in lots of several gallons, sweetened with cane sugar and served in much diluted form. It may even be artificially coloured and reinforced with orange oil or orange extract. In the better stands, however, it is served unadulterated, just as it flows from the orange.

It has been stated on good authority that more than 6,000 large extractors and more than 24,000 of the junior size extractors were in use, and that more than 6,000 carloads of oranges were being used for juice by juice stands of various sorts. In addition, more than 1,250,000 of the Exchange's small reamers for home use had been sold—an indication of the extent to which oranges are used for juice in the home. However, this is not the "whole story," because many home size juice extractors made by other manufacturers are in use, and in many fruit juice stands machines other than the Exchange juice extractors are used.

Constant advertising by the Exchange of the healthful qualities of orange juice has aroused and maintained interest of American consumers in orange juice and has done much to expand the business of the juice stands.

Orange Juice in the Schools.

Several years ago F. W. Bireley and F. Fisher, while students at Stanford University, conceived the idea of dispensing partly frozen orange juice at roadside stands. They supplied such a beverage in the University community and supported themselves in college. After graduation they extended their activities and established fresh juice factories in Los Angeles and in San Francisco. These factories are operated under the names of F. W. Bireley Co. of Los Angeles and the California Fruit Juice Co. of San Francisco. "Early in the game" they decided to supply the fresh juice to the schools. This venture has grown into a large business and has provided a valuable addition to the children's diet.

The juice is reamed from the fruit in the early morning hours, is slightly diluted with water and

sweetened, partly frozen, bottled in bottles of the milk bottle type, and delivered by trucks to the schools. It is dispensed by school cafeterias (eating rooms) and by other means to the children at a price of 5 cents a bottle.

Juice of similar character is being supplied to the schools of San Francisco and neighbouring cities by the California Fruit Juice Co.

By delivery of the juice shortly after preparation and by keeping it partially frozen, it reaches the children before deterioration in flavour sets in. If not maintained cold it would soon become "stale" in taste and would not be bought.

There is perhaps the germ of a similar plan for distributing fresh orange juice to children of other

Orange juice may be sweetened slightly with cane sugar before concentrating; lemon juice receives no added sugar. The orange juice is concentrated to a high density, usually 72° Balling (72 per cent. total solids), or above, and if to be used by the bottling trade is generally preserved by a small amount, $\frac{1}{10}$ to $\frac{1}{20}$ of 1 per cent., of sodium benzoate. Lemon juice is concentrated to approximately 35° Balling. Owing to its high acidity it will keep for some time, although benzoate is usually added.

These concentrates may also be bottled and preserved by pasteurisation at 175° F., although considerable loss in flavour occurs from heating.

In concentrating these juices, glass-lined vacuum pans or pans made of metal that does not corrode

Bullock Transport of Oranges is still Employed in the more remote parts of South Africa.

American and possibly British cities. The volume of potential business is relatively large and does the children a good turn, since orange juice is a healthful beverage.

Citrus Concentrates.

Two factories are producing considerable quantities of concentrated orange and concentrated lemon juices. The pioneer in this field is the Exchange Orange Products Co. of Ontario, California, and the other is the Mutual Citrus Products Co. of Anaheim, California. The former is owned co-operatively by the orange growers' association previously mentioned.

The juices are either expressed from the whole fruit by a special device, or the fruit is halved and reamed by revolving cone. The fruit can be cut in half mechanically, and recently the F. W. Bireley Company has perfected a machine that reams the halved fruit mechanically. Hitherto hand labour has been necessary for the reaming operation.

appreciably have been used. From our experiments we have concluded that stainless steel is best for the purpose because of its insolubility and good heat conductivity. It is essential that a very high vacuum be maintained during concentration in order to maintain a low temperature, preferably below 120° F., in the liquid undergoing concentration.

The juice should be de-aerated by vacuumising at once after expression from the fruit in order to arrest oxidative changes, which result in loss of flavour.

Traces of dissolved iron and copper are very deleterious, accelerating undesirable changes in flavour and colour in the concentration.

Artificial colour is sometimes added; but this practice should be discouraged, since it constitutes sophistication and adulteration.

Sweetened Juices and Syrups.

Rather large quantities of sweetened orange juice and orange syrup are in demand. If less than 50 per

cent. by weight of sugar is added the product is "sweetened juice"; if 50 per cent. or more of sugar is added it is a syrup. Most of these products are used in making bottled carbonated beverages or for preparing drinks at soda fountains. Little is sold for household use.

Usually approximately 1 volume of lemon juice and 3 of orange are mixed. A typical formula is 75 gallons of orange juice, 25 gallons of lemon juice and 700 pounds of sugar. Stir to dissolve sugar. Preserve with $\frac{1}{10}$ of 1 per cent. sodium benzoate. Emulsified orange oil or other orange flavour is added later by the manufacturer of bottled beverages.

portant control measures for minimising deterioration in flavour, aroma, and colour.

1. De-aeration. 2. Flash pasteurisation. 3. Addition of sugar. A fourth to be discussed later is low storage temperature.

Carbonated Bottled Citrus Beverages.

Bottled citrus beverages are of two types, those containing an appreciable proportion of fruit juice and free from artificial colour and flavour, and those consisting principally of artificial colour, artificial flavour, citric acid, and carbonated water. These

Gathering Oranges in South Africa.

In preparing syrups, sweetened juices, and concentrates it is desirable to place the juice at once under a high vacuum (29 inches) to remove occluded and dissolved air, in order to arrest oxidative changes. This should be applied long enough to remove all of the air, which is greatly hastened by warming the juice to 110° to 120° F. in the vacuumising chamber. It is also advisable to flash pasteurise the juice after vacuumising in order to destroy oxidising enzymes. This can be done by heating in a continuous stream to 190° to 200° F. for about 30 seconds, followed by instant chilling to room temperature by means of water cooled coils. Exposure to air during heating and cooling must be avoided.

Addition of sugar greatly retards undesirable changes in flavour. Thus we have the three im-

latter may contain some orange juice (less than 5 per cent.) or may contain none. The writer assumes that readers are interested in those beverages containing an appreciable amount of orange juice, say, 10 per cent. or more.

A satisfactory orange beverage may be made with concentrate or with sweetened juice. The following formulæ (from Circular 313, College of Agriculture, University of California, 1931, pp. 53 and 54, by J. H. Irish) illustrate the procedure:

Formula 1.—With Sweetened Juice.

Prepare sweetened juice of three parts orange juice and one part lemon as previously directed. This should test about 55° to 60° Balling.

To a 6-oz. soda water bottle add 1½ fluid oz. of the

sweetened juice (syrup), or to other sizes of bottles in this proportion.

Fill the bottles with water carbonated at 40° F. to 30 lb. pressure (or containing 2 volumes of carbon dioxide gas). Seal the bottles.

Pasteurise them in water at 150° F. for 30 minutes.

Formula 2.—With Concentrate.

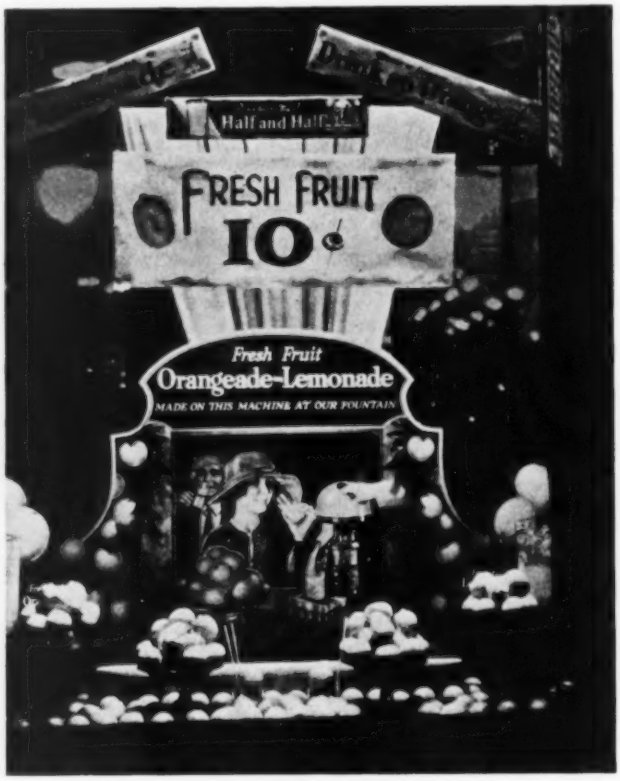
1 gallon of 72° Balling* orange concentrate.

5 gallons of 60° Balling cane sugar syrup (water and cane sugar).

¼ oz. of terpeneless emulsified orange oil.

Mix thoroughly and keep them mixed during bottling. To each 6-oz. soda water bottle add 1½ fluid oz. and carbonated water to fill. Seal. Pasteurise in water at 150° F. for 30 minutes.

It may be advisable also to add a little citric acid to the mixed concentrate and cane sugar syrup, or to add 1 gallon of fresh lemon juice to each 8 or 9 gallons of the mixture in order to give a more pleasing degree of acidity. However, this is largely a matter of consumer preference; we do not know whether British consumers prefer drinks of low or of high acidity.



A Window Display illustrating the Modern Trend towards Fruit Juice Drinks.

Canned Juices.

Canned pomelo—that is, grapefruit—juice has been fairly successful. It is packed in Florida and Porto Rico. It is reamed from the halved fruit, strained, canned, and the cans exhausted at about 180° F. and then sealed and processed at 180° F. It eventually forms hydrogen swells and should be marketed promptly for this reason. "Charcoal" (heavy tin) plate is advisable.

The F. W. Bireley Co. of Los Angeles is successfully canning a sweetened juice, but the process is secret. In our tests we have found the following procedure fairly satisfactory:

Mix one volume of lemon juice to three of orange. Vacuumise at once. Flash pasteurise at 190° to 200° F. Cool. Add sugar to give 50° Balling. Dissolve. Vacuumise again. Can in double-lacquered cans. Exhaust in water at 160° F. Seal. Process 20 to 30 minutes in water at 160° F. depending on size of cans. Cool at once. Store in cool place until sold. Try to sell to ultimate consumer before the product becomes months old.

* Balling and Brix are identical and are also equivalent to per cent. sugar by weight.

Deterioration of Citrus Beverages.

Bottled or canned unsweetened orange and lemon juices are exceedingly short lived. They deteriorate in flavour so rapidly that they usually become undrinkable in less than three months. Addition of sugar to 40° to 60° Balling greatly retards the change.

Concentrates darken in colour and eventually become black. Research by C. P. Wilson and others of his laboratory of the Exchange Orange Products Co., indicate the darkening may be due, in part at least, to the formation of dark-coloured compounds between amino acids and hexose sugars. Low storage temperatures and exclusion of oxygen retard the change. It is more rapid at high than at low concentrations.

The carbonated diluted juices (orange soda, etc.) retain their flavour and colour more satisfactorily than do juices and concentrates; but even they should be consumed within three to four months after bottling.

Frozen Pack Juices.

Recently the National Dairy Products Company, through a subsidiary, packed a large quantity of fresh frozen orange juice in paraffined paper containers at Tampa, Florida. The process consisted in peeling the fruit, expressing the juice, de-aerating the juice, freezing in inert gas, packing partially frozen in the small paper cups, and sealing. The juice was stored at freezing temperatures, shipped to destination frozen in refrigerator cars, and distributed through the company's milk distributing system. Consumer response, it is said, was fairly favourable, but the fact that a much higher price must be charged for juice than for milk, and unavoidable variation in quality, have retarded rapid extension of this plan by this and other concerns.

Frozen juice properly prepared and packed in proper containers, preferably in airtight ones, retains its quality for a long period of time. But whether the product is economically sound and timely at present is debatable. Perhaps some other channel

of distribution than those already tried will prove more successful. Perhaps the best outlets will be to hotels, restaurants, soda fountains, soda water bottling plants, passenger steamers, and other wholesale users.

It remains true that freezing storage has proved the only means thus far of storing orange juice with most of the fresh flavour for long periods of time.

SELECTED REFERENCES

Irish, J. H., "Fruit Juices and Fruit Juice Beverages," Circular 313. University of California Agriculture Experimental Station, Berkeley, California. Revised by W. V. Cruess, 1931.

Cruess, W. V., *Commercial Fruit and Vegetable Products*, New York. 1924. Chapters on fruit juices and syrups.

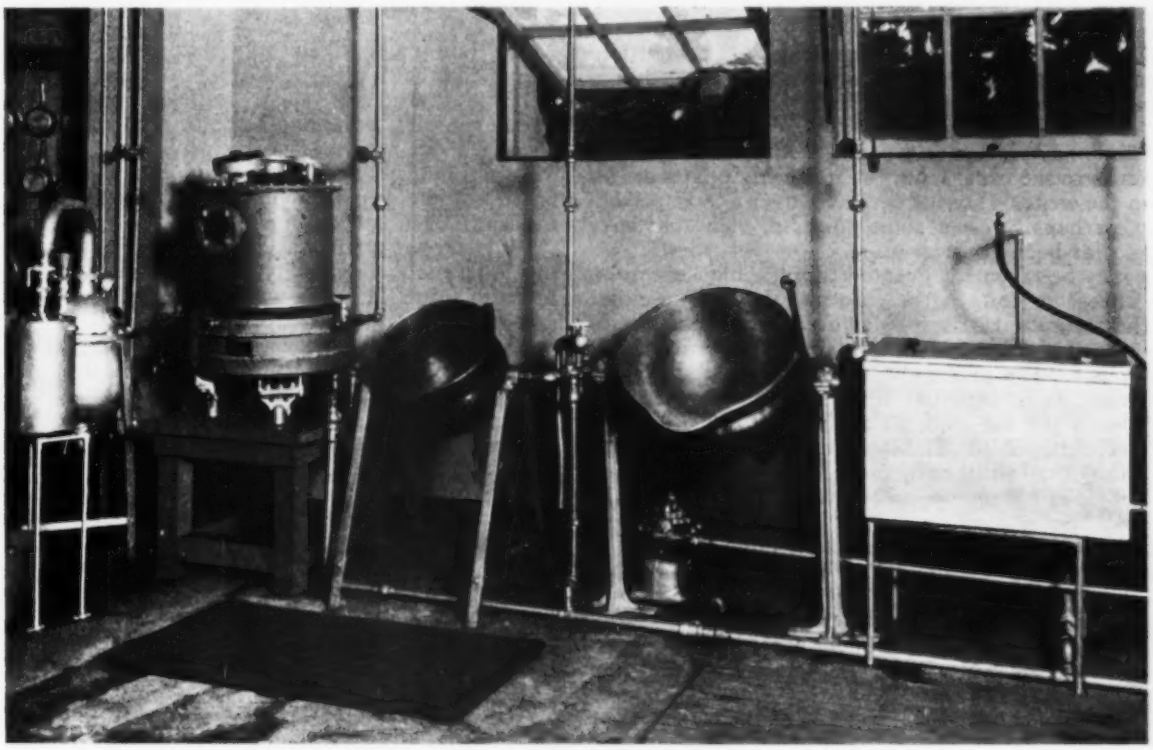
Irish, J. H., "Fruit Juice Concentrates," Bulletin 392. University of California Agriculture Experimental Station, Berkeley, California, 1925.

Wilson, C. P., "Relation of Chemistry to Citrus Products Industry," *Journal Industry and Engineering Chemistry*, vol. 20, 1928, pp. 1302-1305.

Joslyn, M. A., "The Problem of Preserving Orange Juice by Freezing," *Journal Industry and Engineering Chemistry*, vol. 24, 1932, pp. 665-667.

Joslyn, M. A., "Freezing Storage of Fruits and Vegetables," Circular 320. University of California Agriculture Experimental Station.

Cruess, W. V., "Preparation of Fruit Juices in the Home," Agriculture Extension Circular 65. University of California, College of Agriculture, Berkeley, California, 1932.



Cook Room of the Fruit Products Division, University of California.

Banana Flour

WE have from time to time had enquiries about the uses, etc., of banana flour, but although this flour appears at first sight to offer possibilities as an ingredient of fancy breads, cakes, biscuits, etc., the experience of those who have attempted its exploitation has been disappointing. One firm in London writes us: "We went very fully into the possibilities of working up a demand for banana flour, with biscuit manufacturers, vegetarian restaurants, and others, but we found that the small amount of interest that existed a few years ago has completely died out."

The "Pitaman" Health Food Co., of Birmingham, who publish a small book on fresh and dried bananas and banana flour, write: "For twenty years we endeavoured to make a trade for banana flour and productions made from same, but we gave it up as a bad job some years ago, having come to the conclusion that the public did not want it and did not consider it was good value."

The small book, referred to above, gives a number of recipes for using banana flour; we notice banana bread, banana pudding, banana biscuits, and so on. It is recommended to mix banana flour with wheat flour in equal proportions, or one-third of the former and two-thirds of the latter. Any ordinary recipe for making bread or cakes may be used, the two flours being simply mixed together.

Blackening of Pasteurised Cheese

Wrapped in Tinfoil

By H. J. PALMER, A.I.C.

Work's Chemist, Messrs. Swift & Co., Ltd., London

THE QUESTION of blackening of pasteurised cheese wrapped in tinfoil is one that has led to constant differences of opinion between the cheese manufacturer and the tinfoil maker.

There have been many and conflicting opinions given as to the causes, but the following points drawn from the writer's own experience, over a long period, may, perhaps, present some points of view that have not so far been considered.

It may be taken for granted that the blackening on the cheese or foil, as the case may be, is due either to the formation of sulphides or oxides of tin, or of the traces of other metals contained in the tin. Antimony is usually present in tinfoil to a moderate extent, and it is essential for technical reasons. In regard to the influence of antimony on blackening, we have never found blackening any worse with antimony than without it, and it is the writer's opinion that it does not influence blackening any more than tin itself does.

Lead if present will cause blackening, but there is a legal limit to the amount of lead permitted in tinfoil, and analyses have usually shown the lead content of tinfoil to be well below the limit.

Other metals such as copper, iron, bismuth, etc., if present in quantity, will give rise to dark-coloured sulphides, but as they are only present in small traces, if at all, they cannot be considered as the cause of the trouble.

Given tinfoil of a prescribed degree of purity, and made by a conscientious foil maker who knows his business, we should be able to rule out any possibility of blackening occurring.

In practice this is not so, and we must consider how much of the trouble is due to variation in cheese quality, and how much is fundamental.

With regard to the variation in cheese quality, there has been much disagreement among chemists as to how the quality affected the foil, one school maintaining that foil will discolour and disintegrate if the acidity of the pasteurised product is too high, and another school maintaining that the same thing will happen if the acidity is too low.

In the manufacture of pasteurised cheese, we are dealing with a very variable raw material, and there is no question that, if proper care is not taken, many troubles will result and the manufactured product will vary considerably.

One of the greatest variables is acidity, and practical observation has shown that blackening is much worse and more likely to occur with a low acid cheese than with a high acid one. The reason seems to be that low acidity appears to favour the destruction of the complicated amino acids of protein, which are produced during the cheese ripening process. This destruction gives rise either to sulphuretted hydrogen or to soluble sulphur compounds which attack the foil and cause blackening.

With proper analytical control of the manufacturing operation the acidity can be maintained at a uniform value, but even with these precautions blackening can and does occur.

There have been numerous attempts at coating the inside surface of the tinfoil—that is, the side in contact with the cheese—with some kind of transparent varnish which prevents actual contact of the cheese with the tinfoil. The writer has experimented with many of them, and some have been distinctly good, and others no use at all. We developed a method of ascertaining approximately the degree of resistance of the coating to chemical action. This simply consisted of putting a drop of concentrated lactic acid on to the coated foil and noting how long it took the lactic acid to penetrate the coating and act on the foil, this being blackened by the action, and comparing these results with coated foil known to give good results in practice.

Another very important factor in a foil coating is the degree of "tackiness"; in other words, the adhesion of the foil surfaces at the points where the tinfoil edges overlap on the wrapped portion of cheese.

Practical observation has shown that, whenever air has a chance to get in between the foil and cheese surfaces, blackening is rapidly accelerated, and in this seems to lie one of the most important contributory causes of blackening. A "tacky" coating, by its very nature, effects a much closer union of the tinfoil surfaces, and so prevents the access of air which not only helps blackening but, what is even more serious, causes the development of mould on the cheese.

An average, good, all-round coating will resist the action of concentrated lactic acid about three or four hours, and it is possible to obtain foil having a very hard, glassy coating, which will resist the action of lactic acid indefinitely, and will not blacken. Such foil, however, does not seal properly at the overlapping foil surfaces, and moulding of the cheese results at these points. At first sight, it might be considered

that the problem was analogous to the lacquering of tins for canning purposes, but in this case the coating can be stoved on to the tinned iron surface, and the sealing of the tins, owing to the fact they have seamed joins, does not present the same difficulty as a plain lay-over tinfoil join.

The fact that blackening is always accelerated by the presence of air led to the examination of foil-wrapped cheese over nine months old. This was packed tightly in a round cardboard container, and when examined was found to have a small deposit of a dirty white powder over the outer surface. This foil was coated with an ordinary, average-quality, coated foil and, apart from the powder outside, presented an unbroken and unshrunk appearance. There was no blackening on either the cheese or the foil, and the cheese was sound. Other boxes were examined. In some cases the cheese had shrunk considerably and the foil was cracked and deteriorated. In most cases where the tinfoil was in an unsound condition there was more or less blackening.

It was also noticed that the amount of greyish-white deposit differed in the various boxes, and wherever the tinfoil had deteriorated most the deposit was heaviest.

We have not yet completely investigated the nature of this white deposit, but the important point about it is that, since it occurred on the outside of tinfoil wrapped around otherwise sound cheese, there seems to be some external action on the tin, in addition to any possible internal ones, and it is a question how much of the breaking down of tinfoil wrappings on cheese is due to external action on the foil, and how much to internal action from the cheese itself. Naturally, storage conditions will modify the degree of external as well as internal action. Damp, warm storage is a very unfavourable condition for satisfactory keeping.

In this connection it is interesting to note that the cardboard boxes containing cheese portions have a moisture content of about 9 per cent.

It has been shown that internal action can be considerably reduced by suitable measures, and we carried out the following series of tests to see what further information could be obtained.

	Cheese Acidity (as Per Cent. Lactic Acid).	*Description of Foil.*	*Results after Nine Months.*
Sample 1	2·0	Uncoated.	No blackening.
,, 2	1·7-1·8	Uncoated.	Slight blackening.
,, 3	1·7-1·8	Coated on inside surface.	No blackening, but a dirty white powder on outside of foil.
,, 4	1·9-2·0	Uncoated on inside surface. Coated on outside surface.	No blackening. No powder formation on outside of portion. Cheese in fine condition.

The result of sample No. 4 is very interesting; the difference in appearance between it and No. 3 was very marked. The presence of the dirty powder on No. 3 showed definitely that it was an old packing, but No. 4 had the appearance of having been freshly packed.

Summary.

1. Of first importance is to make certain that all possible ways by which air can gain access between cheese and foil are completely avoided. Even with a coating, if this condition is not secured blackening may occur.

2. It is very desirable to use a coated foil, with a coating of the very best description, as although a coated foil may blacken, the chances of its doing so are much less than with an uncoated foil. The ideal would be to use foil coated on both sides, but under ordinary storage conditions and the usual time the cheese is kept before sale it is not really necessary.

3. Avoidance of a low acid content in the pasteurised product. Careful analytical control of the manufacture is necessary to ensure this. Too high an acidity must also be avoided on account of other troubles.

4. The tinfoil must be carefully examined for pinholes, as they will cause rapid breakdown of the tinfoil wrapping. In this connection close control of foil gauge is advisable, as breakdown will also occur rapidly if the gauge is too light.

Canned Fruit Condemned

A CONSIGNMENT of canned fruits arrived at Manchester from the Pacific Coast via the Panama Canal. These had been stored in two compartments on each side of the boiler room. The spaces in which they were contained were ventilated by two cowl ventilators and two grated bunker hatches each. The latter had been kept covered over because of bad weather, for three weeks. Heat from the boiler room brought about chemical action in the cans. A large number of the cans were blown by hydrogen gas, which with sterile cans points to a temperature of at least 149° F. having been attained at some distance from the hot bulkhead.

Analyses by the Manchester City Analyst of the contents of blown cans and others apparently sound but dark in colour, resulted in the detection of the presence of tin in varying quantities up to 2·7 grains per pound. The dark tins were those containing dissolved iron as well as tin, but as independent analyses of tins having apparently sound contents proved tin to be dissolved to the extent of 1·1 grains per pound, every sealed can was judged to be a source of potential danger, and the whole consignment was condemned.—M.O.H., Port of Manchester Annual Report, 1931.

NEWS has been received by cable of the death, in South Africa, of Mr. A. C. Maytham, Managing-Director of Maythams, Ltd.—a well-known firm of tin and sheet metal goods manufacturers of Johannesburg, Durban, and Capetown.

Mr. A. C. Maytham's eldest son, Mr. A. A. Maytham, is General Manager of Messrs. Dewey and Almy, Ltd., Edmonton, No. 18.

LIQUORICE PRODUCTS

AS A raw material, liquorice, in the form of block juice, sheets and strips, is used by a great number of food manufacturers and particularly by sugar confectioners, and it is, therefore, very surprising that there should be so little literature dealing with its occurrence and production available in this country.

Liquorice root, from which all commercial liquorice is manufactured, is yielded by a group of plants, the *Glycyrrhizæ* of the natural order Leguminosæ. The principal species are *G. glabra* and *G. glandulifera*, but many other smaller species are known and utilised to a greater or less extent. For drug purposes the British Pharmacopœia allows any species of glycyrrhiza which complies with the official description and does not recommend any particular one.

When the liquorice industry first began to develop in England a good quality root (*G. glabra*) was grown in Yorkshire—hence the concentration of the manufacture in that district—but the demand has since outgrown this comparatively small supply and to-day the principal sources are:

1. Spain, whence we have the finest quality of *G. glabra*, usually that which is sold by druggists as "Spanish Root."

2. Italy and Sicily, which cultivate the same species as Spain, but the exported material is principally in the form of block juice and sticks.

3. Southern Russia, where *G. glandulifera* grows wild on the banks of the Volga and other rivers. This is not such good quality as (1) and (2), having a rather too pronounced bitter taste.

4. Syria and Persia, from which a fair quality root is exported, principally to the United States.

5. Manchuria, where a low grade and little-known species is found. It is somewhat deficient in sugar content and is therefore not so attractive to the manufacturer.

The herbaceous stem of the plant is of no value, but the root, which divides a short way below ground-level into several straight branches, and the horizontal runners which are thrown off just below the surface, are equally used in the commercial production of liquorice. When these are exported, it may be in the natural state or with the outer membrane peeled off, they are very carefully dried before being packed.

Extraction.

The actual process of extraction is broadly similar to the extraction of sugar from the sugar cane. The root is in the first place crushed under considerable pressure to disintegrate the structure and is then macerated for a time in boiling water. The solid matter remaining is again crushed to secure complete extraction. The liquor thus obtained is allowed to stand until it is clear and is then drawn off into large clean vats, where it is carefully evaporated by slow boiling. When the required consistency has been reached it is allowed to cool somewhat and is then formed into blocks or sticks as required, and left to cool and dry.

The root in the natural state contains approximately: 6 per cent. glycyrrhizin—the potassium and calcium salts of glycyrrhizic acid, an intensely sweet white crystalline powder which forms the demulcent for which liquorice is used in pharmacy; 4 per cent. sugars, comprising roughly 1½ per cent. glucose and 2½ per cent. sucrose; 30 per cent. starch.

The aqueous extract when dried at 100° varies between 15 per cent. and 27 per cent., but the official minimum is 20 per cent. In the best stick liquorice the composition is entirely different, there being approximately: 12½ per cent. glycyrrhizin; 13 per cent. sugars; 22 per cent. starch.

The natural root and some of the better qualities of liquorice sticks are retailed by druggists in the state in which they are imported, but the average quality of block juice is too concentrated to be suitable for human consumption, and to render it palatable a further process must be gone through during which flour (preferably wheat flour), sugars, and gelatine are added, and, incidentally, a very large proportion of water is taken up.

Liquorice Products.

The method used in this process is as follows: The block juice is first melted by heating in a low-pressure jacketed steam pan, with rather more than its own weight of water—say, 8 pounds of block juice to every gallon of water. This part of the process should be carried out slowly, and it is essential that the batch should be stirred continuously to avoid the possibility of scorching.

When the liquorice is entirely melted, the sugars (approximately two parts of crystal sugar to one part of glucose) are added, having been previously melted in water and boiled to ensure the breaking down of all the crystals. The mixture is then boiled again and strained through a fine sieve. The gelatine, previously soaked in cold water until quite soft, is then added and, finally, the flour is slowly stirred in.

Once more the batch is brought to the boil, colour is added, and the whole cooked slowly until the required consistency is reached. It is then removed to a cold slab and allowed to cool off partially. When just set the batch is passed through the liquorice press and taken to the drying-room to harden. To obtain a glossy surface the batch when dry can be passed through a weak glazing solution and again dried.

The actual proportions of the material used vary considerably in accordance with the views of individual manufacturers, and also in regard to the required cost of the finished article. The percentage of liquorice, however, is small, rarely exceeding 8 to 10, and the water content varies between 15 and 25 per cent., though the latter should be regarded as a maximum. Because of this high percentage of water, considerable care should be exercised in storing liquorice sheets and pieces, a warm, dry atmosphere tending to dry out the moisture, while dampness is inclined to produce mould.

TREATMENT OF RAW CACAO IN WEST AFRICA

By H. W. AVIS

THE TREATMENT of cocoa in the raw state in the native countries has given the manufacturers much food for thought on more than one occasion. There is still room for improvement, especially on the west coast of Africa, and it must not be overlooked that out of 334,965 tons of cocoa exported from Empire countries in 1931, no less than 244,094 tons came from the Gold Coast, and 49,256 tons from Nigeria,* and it is in these countries that cocoa is still handled in a primitive fashion.

The main treatment in these countries is fermentation, the purpose of which is to develop the flavour, for unfermented cocoa has a harsh and astringent taste. Fermentation also tends to make the kernels more brittle and easier to grind.

The pods when ripe are cut from the trunk or main branches and are split open, the white pulp containing the seeds scooped out into a box or basket usually lined with banana leaves and the entire mass sometimes covered with leaves. The mass is either turned or transferred to another box every day or two to prevent the temperature rising above about 40° C.; if this is not done, a partially anaerobic condition is set up, causing an uneven fermentation, and the beans are more liable to go mouldy.

As the fermentation proceeds, the white pulp surrounding the beans is converted into an acid liquid, the bitter taste changes, due to the oxidation of the tannins, the germ is killed, and the colour changes from slaty grey to a reddish or purple-brown, the entire process being completed in from four to eight days.

The beans are then laid out in the sun for at least three days in order to make certain they are thoroughly dry. They contain at this period 7 per cent. or less moisture according to the grade, some of which is lost during transit, and the beans usually contain from 1 to 2 per cent. moisture on arriving at their destination.

If the pods are too ripe when picked, germination will have taken place, causing the radicle to break through the shell, often leaving a small hole which renders the bean more liable to attack by weevils and moths. Care must also be taken to ensure the cocoa being thoroughly dry, as it has been found that cocoa with over 8 per cent. moisture is liable to go mouldy, especially in a humid atmosphere.

A flaw which occurs more frequently in West African cocoa than any other is that known as the White Spot disease, and opinions differ as to the seriousness of this disease. It consists of white spots which appear on the bean itself and consist of cocoa fat and other deposits, and as it occurs generally during the harmattan, it is suggested that this may be produced as a result of the rapid evaporation by the dry winds which takes place during fermentation.

The system of compulsory examination and grading in Nigeria has done much to improve the quality, but in this country cocoa still has a very large percentage of under-fermented beans in it.

* The 22nd Report of the Imperial Economic Committee. *Cocoa.*

The Main Street in Lagos.

This can only be rectified by educating the native farmers, which is likely to prove a difficult task, for, unlike the West Indies where the cocoa is grown on plantations, it is grown by many small farmers who each own their small plot of ground; naturally, they ferment their cocoa how and where they like and can take it to market whether the fermentation is complete or not as long as it is dry.

One possible way to ensure the correct fermentation is to set up communal fermenting sheds where the cocoa would be properly fermented and thoroughly dried before being sold. The farmer, even though he had to pay for the use of the sheds, would gain owing to the increased price he can obtain for fair fermented cocoa. A scheme of co-operative farming and marketing is being tried out in the Gold Coast, but has only been in operation a few years and is as yet in its infancy.

Among the many suggestions which have already been made for improvements in the treatment of raw cocoa is the plan advocated by Dr. Alfred Laessig*—viz., that of washing and drying the cocoa artificially. This plan has been advocated for many years in the columns of the German magazine, *The Gordian*. There seem, however, to be many objections to his proposal. One such objection is the extra expense and loss in weight involved, and *The Gordian* in 1925, while advocating washing, admitted that the manufacturers would have to pay more for their cocoa. It is also very doubtful whether the cost of running these plants, situated in remote districts, would be warranted. A Bulletin* of June, 1932, says: "It is generally held that the disadvantages of the brittle shell quite outweigh the advantages of cleanliness. On handling, the washed shell easily breaks. Broken beans store badly and are a nuisance to manufacturers."

It would appear, therefore, more profitable to turn to a higher degree of efficiency in the fermentation rather than to the absolute cleanliness of the beans, and already the authorities of Nigeria have instituted a very strict inspection of cocoa, with regard to stones, germinated, and small beans; and the figures of cocoa examined in New York show that Nigerian cocoa had a smaller percentage detained as unsatisfactory than that of the Gold Coast, but unfortunately this cocoa is still considered to be of a very low quality, and a very large proportion of the cocoa sold under the grading scheme is only used for the extraction of the cocoa butter.

The whole problem seems to revolve round the proper control and supervision of fermentation, and

* See FOOD MANUFACTURE, August, 1931, p. 233, "Improvements in the Preparation of Cacao Beans," Dr. Alfred Laessig.

* *Bulletin Officiel de l'Office International des fabricants de Chocolat et de Cacao, June*, 1932, "The Kind of Cocoa the Manufacturer Wants," A. Knapp, assisted by E. Wiehr and Leon Olivier.

Cacao Beans ready for Fermenting, as Practised on the Gold Coast.

Drying Cacao on the Gold Coast.

Mats made from bamboo or the mid-ribs of oil palms, supported on trestles, are used for this purpose.

until some means can be devised and put into operation there seems to be very little chance of reaching the same quality as that produced in some of our other colonies. The Agricultural Department of Nigeria are doing their best to encourage farmers, but it is proving a slow and tedious operation. The farmers have also been discouraged, as they have not been able to secure a good price for their produce for some time past. When they can be ensured a good and stable price, then, perhaps, they will start to devote their attention to improving the quality, and it is to be hoped that soon we may see an increased crop of first quality cocoa from the West African coast and Nigeria in particular.

Sulphur and Corrosion

IT will be remembered that Mr. Clark and his associates at Seattle have done important work on the corrosion of cans, particularly with reference to the influence of sulphur compounds. At the present time a paper is being prepared covering the research they have been carrying on since 1923 on the effect of sulphur compounds in either retarding or accelerating corrosion in certain canned foods. In 1924 they published a paper on the effect of the lime-sulphur spray on canned gooseberries, from which it appears that this practice is likely to result in the corrosion of the can, in the production of hydrogen gas which may distort the can, in the blackening of the can, and in the formation of a hydrogen sulphide odour which may render the fruit inedible. Also, it appears that lacquered cans do not resist this corrosive action much better than the plain cans, but that relacquered cans have a higher power of resistance. The presence of syrup retards the corrosion.

This work inspired further investigations into the effects of different sulphur compounds in canned foods, and the results obtained, which are to be embodied in the forthcoming paper, are quite extraordinary.

Some compounds are highly beneficial and act as preventatives of pin-holing and swelling, while other compounds, particularly sulphites and sulphides, produce violent effects of a totally different nature. We look forward with great interest to the publication of this paper.

Creamed Chestnuts and Stuffed Fruits

By JOHN ELSBURY

Creamed Chestnuts.

Spanish chestnuts are the best to use. On one side only of the nut make a short slit in the skin, taking care to avoid cutting the nut. Then place the nuts in cold water and bring to the boil. After simmering gently for 2 minutes, replace the nuts in cold water and remove the skins.

Place the nuts in a clean tub and cover them with a hot syrup made by dissolving 5 lb. of sugar in each gallon of water. Allow to stand for 24 hours. Then run off the syrup into a steam pan, add 2 lb. of sugar to each gallon of syrup, boil to 220° F., and pour the solution over the nuts in the tub.

Allow to stand for 24 hours, after which run off the syrup into the steam pan and add 2 lb. of sugar and 1 lb. of glucose to each gallon of the syrup. Boil to 230° F. and allow to stand for 48 hours.

Place the nuts on wire trays to drain. Then transfer to the hot room to dry for 24 hours at 90° to 100° F.

The nuts are then creamed. This is done by first boiling to 229° F. each gallon of water, with 20 lb. of sugar and 2 lb. of glucose. This "cream syrup" is then poured over the nuts contained in a hand pan, and they are grained up until quite white and creamy, after which they are drained, allowed to dry, and finally packed.

The cream may be coloured as desired. In carrying out the above operations, care should be taken to avoid breaking any nuts. Broken nuts may be used up in cake making.

Sweet Spiced Stuffed Onions.

Transfer No. 2 silver skin onions from brine to hot water, in which they are soaked for 2 hours. Then, by means of a small round stick, push out the centre of each onion and replace by a piece of red Spanish pimento, as in stuffed olives. The onions are now placed in sweet spiced vinegar for 7 days, after which they are packed in glass jars, arranging them so that the pimentoes are visible through the glass. The jars are filled with the sweet vinegar, which has been filtered, and finally capped or corked.

For the preparation of the sweet spiced vinegar the following may be used:

White sugar	146 lb.
16 vinegar	14 gal.
24 vinegar	6 gal.

The mixture is boiled and well skimmed, and then flavoured with oils of pimento, cassia, and nutmeg.

Stuffed Prunes.

The prunes for stuffing should be free from sugar. If not, they must be dipped into hot soda water and spread out to dry. When dry they are rubbed over with glycerine to impart a good polish.

The prunes are now slit with a knife at the stock end and the stones squeezed out. The prunes are then stuffed with half walnuts, previously skinned, and afterwards packed in small boxes or cartons. In the former case the boxes should be reversed for packing and the contents well pressed so as to present an attractive appearance when opened.

The best size of prunes for this purpose are 60–70, but 70–80 may also be used.

Stuffed Dates.

The dates to be used for stuffing should be clean and bright. If they show any signs of sugar they should be washed in weak soda water at about 160° F., afterwards wiping them dry with a clean cloth that has been dipped in glycerine.

Slit the stock end with a knife and squeeze out the stone. Stuff with a piece of preserved angelica, leaving the end visible.

Pack in small boxes, gently pressing the face flat and polishing it with a clean cloth moistened with glycerine prior to nailing on the lid.

Washed Pulled Figs.

The best for this purpose are Spanish summer figs, but Italians may also be used. On arrival they must be washed in soda water, after which they are dipped in a solution made up of:

Water	20 gal.
Glucose	7½ gal.
Glycerine	10 pints.

This mixture is brought to the boil in a tank fitted with a closed coil. The figs, placed in a basket, are immersed in this solution for about 2 to 3 minutes (100 lb. of dried figs should give 110 lb. of washed figs) and then allowed to drain with the basket standing or suspended over the tank.

The figs are transferred from the basket to a table and packed into small boxes, ½, 1, 2, 4, and 7 lb. each. The box is lined with waxed paper and packed upside down.

By means of a knife the figs are split halfway through and then pulled to spread them out. They are then arranged split side up in layers in the box, pressing gently with the hand after the third or fourth layer so as they shall present an attractive face when the box is opened. Here and there a small, dry bay leaf should be packed along with the figs in order to impart an agreeable flavour. On completion of the packing the bottom is nailed on and the box reversed and stencilled. Figs so packed will keep well for 4 to 6 months.

Fig and Nut Cake.

This valuable foodstuff is made from washed figs and roasted peanuts.

The figs, after passing through a mincing machine, are well mixed with the coarse-cut nuts, and the mixture spread out on a sheet of rice-paper in the form of a layer of about an inch in thickness. This is then covered by another sheet of rice-paper. The whole is pressed and cut up into squares, which are packed into small boxes or cartons lined with waxed paper. The preparation of these cakes is a convenient way of utilising those figs that are unsuitable for washed pulled figs.

Manufacture of Flavouring Essences

By H. STANLEY REDGROVE, B.Sc., F.I.C.

AS EXPLAINED in a previous contribution to FOOD MANUFACTURE, flavour is essentially an olfactory phenomenon; and the flavour of such natural products as herbs and spices, for example, is due to the presence in them of volatile constituents. These can usually be separated by the process of steam-distillation and obtained in the form of liquids, known as "essential oils." Hence, there are two primary methods of manufacturing natural flavouring essences—namely (*a*) extraction of the raw material with a suitable solvent, and (*b*) dissolution of the essential oil in a suitable solvent.

The second method always entails some loss in flavour, as the process of distillation tends to alter the character of the essential oils, either by hydrolysis of such constituents as esters, or by washing out water-soluble constituents. In many cases, however, this loss in flavour is very trifling, and the method possesses the advantage of yielding essences free from the non-volatile astringent substances present in certain spices, etc.

In the case of vanilla, however, since the main flavouring constituent is a crystalline solid (vanillin), the extraction method is always employed. Moreover, there are some spices, such as ginger and pepper, which possess a pungent taste, as distinguished from a pungent flavour. This pungency is due to non-volatile constituents. The public demand that the pungency shall be preserved in, for example, essence of ginger. This essence, therefore, cannot be made by simple dissolution of ginger oil in a suitable solvent. It is necessary to use an extraction method, or, alternatively, to prepare the essence from ginger oleo-resin, which is simply a concentrated extract of the sapid and odorous constituents of ginger made by means of a volatile solvent (*e.g.*, acetone), which is afterwards removed.

Choice of Solvent: Ethyl Alcohol.

In the U.S.A. regulations have been laid down by the Department of Agriculture for the preparation of flavouring essences known as "extracts." These have all to be prepared with ethyl alcohol of the proper strength as solvent, though the addition of glycerol is permitted in certain cases (*e.g.*, tonka and vanilla extracts). In the majority of instances, the regulations provide for the extracts to be made from the essential oil, the minimum content of which is specified in each case.

Flavouring essences prepared with other solvents are known in the U.S.A. as "flavours," but the use of iso-propyl alcohol, acetone, and mineral oils is not permitted.

There can be no questioning the fact that ethyl alcohol is the ideal menstruum for flavouring essences, and any British manufacturer of these commodities who wishes his products to be well-esteemed is wasting his time if he searches for a substitute. As flavouring essences are not usually very strong, a high alcoholic content is not necessary. Tables showing the solubility of various essential oils in ethyl alcohol diluted with various proportions of water have been drawn up, and from these it is a simple matter to calculate the maximum amount of water that may be incorporated in a flavouring essence without causing opacity due to the throwing out of solution of insoluble constituents of the oil.

Among essential oils which are not readily soluble in diluted ethyl alcohol are the *Citrus* oils (*e.g.*, lemon and sweet orange). In this case the difficulty can be overcome by using terpeneless oils—that is to say, natural oils from which the terpenes have been removed, as it is these constituents which are especially difficult of solution in diluted ethyl alcohol. The terpenes are not of great flavour value; moreover, they are indigestible, so that their removal is, from the point of view of the flavouring-essence manufacturer, in every way advantageous.

Substitutes.

In the preparation of some flavouring essences, more especially vanilla essence, glycerol may be advantageously employed as a solvent in conjunction with ethyl alcohol. It is not, however, of general utility.

The question of whether iso-propyl alcohol is suitable for use in the preparation of flavouring essences has been hotly debated. It has been maintained, with some show of reason, that the amount consumed is too small to be innocuous. But whether this is the case or not—and the U.S. Department of Agriculture does not regard it as so being—the use of this solvent mars the flavour of the essence considerably. Acetone is even more objectionable from every point of view.

Glycols are sometimes employed. Ethylene glycol, however, has recently been found to be poisonous, presumably due to its oxidation in the body to oxalic acid. In any case it is not a good solvent. Propylene glycol appears to be harmless. Solvents of unknown composition, sold under fancy names, are better avoided.

Although ideal for general use, flavouring essences made with ethyl alcohol are not suitable for use with certain classes of goods—for example, boiled sweets—where the volatility of the spirit proves a big disadvantage. For use with these goods, flavouring extracts made with edible vegetable oils are preferable. These are made by the simple dissolution of the flavouring material (essential oils or synthetic products) in a suitable fixed oil. Cotton seed oil should not be employed, nor should mineral oils.

Emulsions.

Essential oils may also be used in the form of emulsions, in which water is the main constituent. In recent years, Whitmore and Lineham (*Industrial and Engineering Chemistry*, vol. 21, 1929, pp. 878-80) have published the results of a research, in which they have found that satisfactory transparent emulsions of certain essential oils can be made by the aid of gelatin, the medium in which the oils are dispersed being a solution of cane sugar and invert sugar in water.

In general, however, emulsions are not found so satisfactory in use as alcoholic essences. In particular, the chances of the essential oil undergoing oxidation, with consequent loss of flavour, are much increased.

Manufacturing Methods.

The manufacture of flavouring essences from essential oils is simplicity itself. All that is necessary is to dissolve the oil in the requisite quantity of alcohol and then dilute with the calculated quantity of water. Filtration through kaolin or talc may sometimes be necessary; but this may be avoided by the use of spirit of sufficient strength to hold all the constituents of the oil in solution.

When an extraction method is employed the process is more complex. In particular, the manufacture of satisfactory vanilla essence is very tricky and cannot be dealt with here, as the subject could be treated adequately only in an article of considerable length devoted to this one topic alone.

There are four extraction methods—namely, cold maceration, hot maceration, percolation, and continuous percolation. Cold maceration is effected by mixing the roughly comminuted spice or herb with the solvent in a suitable vessel, which is frequently fitted with a stirring device. After the lapse of sufficient time, the essence is either drawn off or expressed and, if necessary, filtered. The hot maceration process differs from this only in the fact that extraction is facilitated by the application of heat. This effects a saving in time, but, as many flavouring constituents are injured by heat, the resulting essences are not usually so fine.

Percolation is effected by packing the ground material into a percolator and macerating it with the solvent for some time. The stop-cock at the base of the container is then opened. As the solvent charged with the extracted matter runs out more of the solvent is allowed to run in at the top, so as to maintain a constant level, until extraction is complete. Usually a battery of percolators is employed, the relatively dilute solution from one passing automatically through the next, and so on until a highly concentrated extract is obtained.

Continuous percolation is effected by using an apparatus in which the solvent is continuously evaporated from the resulting extract, the vapour being condensed and allowed to trickle through the material again and again.

Quite frequently a combination of both extraction and dissolution methods is employed. That is to say, a relatively weak essence is first manufactured by one or other of the extraction processes described, and then fortified by the addition of a small quantity of the corresponding essential oil.

Numerous formulæ have been published. Interested readers are more especially referred to Walter's *Manual for the Essence Industry* (New York and London, 1916) and Kessler's *Practical Flavouring Extract Maker* (Second Edition, New York, 1927).

Fruit Flavours.

The flavours of fruits, as well as herbs and spices, are due to the presence in them of essential oils. The *Citrus* fruits are exceptional in that their essential oil content is relatively large. The oil is present in the peel and can be obtained either by direct expression or by means of steam-distillation, the latter process yielding products much inferior in flavour to the former. In general, however, the proportion of essential oils in fruit is very small, and their extraction on a commercial scale is impossible. The chemistry of the essential oils of apples and peaches has been investigated by Power and Chestnut (*Journ. Am. Chem. Soc.*, vol. 42 (1920), pp. 1509-26; vol. 43 (1921), pp. 1725-39; vol. 44 (1922), pp. 2938-42 and 2966-67); but, in general, the composition of the essential oils of fruits, *Citrus* fruits excepted, is not known.

Associated with the essential oils of fruits are certain acids, which give to the fruits a background of taste necessary to the full enjoyment of the flavour. The sugar present performs a similar function. The presence of these acids is therefore desirable in fruit flavouring essences. The juice, containing the essential oil, may be expressed from the ripe fruit, the pectin as far as possible removed, and the liquid concentrated, preferably *in vacuo*. Some fruits are particularly difficult to treat, as their flavours are very

susceptible to the action of heat. Strawberries provide a case in point.

The addition of a preservative to the concentrated juices is essential to prevent decomposition. About 30 per cent. of alcohol may be used, or the juice may be converted into a syrup by the addition of 60 per cent. or more of sugar.

Some fruit pulps may be directly extracted with alcohol—for example, those of raspberries, strawberries and black currants. In the case of the last, the leaves should also be extracted, as they are rich in aromatic material. Pre-fermentation of some fruit pulps with sugar for a few days is recommended—for example, those of pears, raspberries and black currants.

As Jensen (*The Chemistry, Flavouring, and Manufacture of Chocolate, Confectionery, and Cocoa*, London, 1931, p. 355) points out, "fruit flavours are at their best when a certain balance of acid, sugar, and flavour occurs." He gives the following useful figures: No. of parts of acid per 100 parts of sugar for various fruit flavours—Apple, 14; orange, 17; lemon, 200; strawberry, 16; raspberry, 47; black currant, 55.

Artificial Flavours.

Fruit flavours, more perhaps than any others, are imitated by blending together various aromatic materials of synthetic and natural origin. The results almost invariably fall short of the natural flavour; and it cannot be said that the art of compounding synthetic flavours has been carried to the same pitch of perfection as that of compounding synthetic perfumes. The olfactory is undoubtedly man's most delicate sense, and it would seem to operate more delicately in the detection of flavours than in that of odours pure and simple. Many, if not most, of the published formulæ for synthetic fruit flavours are completely worthless. Some modern formulæ of a more useful type will be found in Jensen's work already quoted.

Two natural flavouring essences for which artificial substitutes are often offered are almond and vanilla. The chief aromatic constitutent of bitter almond oil S.A.P. is benzaldehyde, and the chief aromatic constituent of vanilla is vanillin. These essences, therefore, are prepared with synthetic benzaldehye and synthetic vanillin respectively. In the case of the latter, coumarin or tonka bean extract is also often added, or ethyl-vanillin ("Bourbonal," "Vanillal"), which has a flavour like that of vanillin but much stronger, may be employed. Although these essences contain the chief aromatic constituent of the natural products, their flavours lack the modifying effect of the other constituents, and hence fall very far short of the genuine natural essences.

Compound Flavours.

In addition, there are manfactured a considerable number of compound essences required by various classes of food manufacturers. For example, to meet the public taste a little oil of lemon is often incorporated in ginger essence, but many of the compound essences are, of course, of a much more complicated character than this, both essential oils and aromatic synthetic products being used in their manufacture. For the preparation of these compound essences no new manufacturing methods are required, but the manufacturer has to study the requirements of the particular trades for which he is desirous of catering and to master the art of building up, from the immense range of aromatic materials at his command, both natural and synthetic, satisfactory flavours to meet these requirements.

FOOD GROUP

THE following announcement was recently made with regard to the Food Group of the Society of Chemical Industry.

Prof. Raistrick has hitherto filled the joint office of Honorary Secretary and Treasurer. At his request the Committee relieved him of the Treasurer's duties and appointed Dr. H. E. Cox to be Hon. Treasurer of the Group. This caused a casual vacancy on the Committee, which has been filled by the appointment of Dr. H. B. Cronshaw. (Dr. Cronshaw is the Editor of FOOD MANUFACTURE.)

Application for particulars of the attractive programme of meetings, etc., should be made to the Hon. Secretary, Food Group, Society of Chemical Industry, 46, Finsbury Square, E.C. 2.

BOOK COMPETITION

CONSIDERABLY earlier this year we asked FOOD MANUFACTURE readers to let us know what they considered to be the six most useful reference and year books for the food manufacturer, offering a prize of one guinea's worth of books for the list we considered best. The entries received have been exceptionally interesting, displaying a very wide range of opinion, and despite the months that have elapsed since the competition was first announced, occasional postcards stating readers' opinions continue to arrive.

It is time the matter was decided, however, and any reader who has not yet sent in his entry and wishes to do so, should address a *postcard* to the Editor, stating (1) his name and address, (2) the titles and authors of what he considers the six most useful reference books and annuals for the food manufacturer. No entries will be received after December 23, 1932.

Beef By-Products Exhibit at the Royal Sydney Show, 1932, in Australia.

Extract of Meat »

By T. CROSBIE WALSH
F.I.C., F.C.S.

The third article of a series dealing with meat packing and its scientific control.

AS WAS mentioned in the second part of this series of articles, published in the October issue, extract of meat may be made in two ways, one as a by-product of canned meat manufacture and the other by the direct treatment of fresh beef.

At first sight it would appear the simplest of processes—just mincing meat, adding water, boiling up, and evaporating to the necessary pasty consistency. Despite its apparent simplicity, the factors contributing to the final characteristics of an extract of meat are legion and have been subjected to exhaustive investigations in order that standard products may be obtained.

Before going into the details of manufacture, it may be useful to discuss extracts in a general way.

General Considerations.

A genuine extract of meat may be considered to contain substances which will be placed in two Groups, "A" and "B," each with its subdivisions:

Group "A."—1. Inorganic extractives or salts.

2. Nitrogenous extractives, chiefly of a basic character.

3. Non-nitrogenous organic extractives.

With reference to (1) and (2), the yield of these substances depends upon the degree of extraction of the meat, and naturally the aim in manufacture is as complete an extraction as possible. Considerable differences are noted according to the manner in which the original material is extracted and the time of hanging it has received. The latter factor has far-reaching influences not only on yields but also upon the nature of the finished product. In actual practice it must be borne in mind that the yield of these substances, as also that of any specific body, must be considered strictly in percentage weights of the original meat and not as percentages of the extract, since the latter are influenced by the presence in greater or lesser quantity of the products of decomposition of crude protein as well as other products such as lactic acid.

To make this point clear one may take the following instance: Suppose a batch of meat was extracted by means of gentle treatment in such a way that it was ensured that all extractives under Group "A" had been obtained in the resulting solution. By virtue of the mildness of the treatment, the quantity of albumoses and gelatine would be moderate. Suppose that, in another instance, as complete an extraction as regards the same substances—*i.e.*, those comprised in Group "A"—had been made but that, due to more intensive treatment, the amount of albumoses was much greater. Now, given the same nature of the original meat extracted in the two cases, the substances comprised in the three subdivisions of Group "A" would exist in the extract in higher percentages in the first instance and in lower ones in the second, despite the fact that the quantity of each taken from the meat is identical in both cases. The point is axiomatic but, nevertheless, is apt to be overlooked when considering an analysis of extract without due reference to yields from the original meat.

Group "A," Subdivision (3).—As in the case of the first two subdivisions, the yield of these compounds depends upon the degree of extraction of the meat. Another factor influencing yields is the amount of hanging the meat has received before treatment. *Rigor mortis* is produced by the formation of myosin, a product from the protein of living muscle. At the death of the animal, acid begins to form and the acid content of the meat goes on increasing until it reaches a point at which it is enabled to dissolve the myosin and the meat becomes flaccid once more. On extracting beef with the acid reaction resulting from sarco-lactic acid well advanced after hanging, a higher dry extract is obtained, not only due to the presence of this acid but also to greater proportions of gelatine and gelatose, as sarco-lactic acid has the property of acting upon the inter-fibrillar connective tissue and transforming it into gelatine. Thus it is that the increased yield given in the extract from meat ripened by hanging is partly due to gelatine and its decomposition products. Further yield is obtained by the addition of the sum total of practically all the decomposition products of the protein of meat, produced by the action of proteoclastic enzymes. Fatty acids are also formed by the action of fat-splitting enzymes. All the preceding details have an important and direct bearing upon large-scale manufacturing operations.

Group "B."—These are closely connected with the formation of sarco-lactic acid and the action of the enzymes mentioned immediately above.

Small quantities of these substances are to be found in the original meat, but the greater part of them is produced by the treatment to which the meat is subjected during extraction, in combination with acid bodies.

They may be classified as follows: Proteoses, peptone-like bodies, amino acids, amide compounds, gelatine, gelatoses and further hydrolysis products of gelatine.

Any modification of the yield of extract of meat from a particular weight of meat (given also the complete extraction of the bodies in Group "A") is due to the formation of greater or lesser quantities of the hydrolysis products of protein and their subsequent extraction.

This hydrolysis depends upon:

1. The hanging time of the original meat.

Australian Cattle.

2. The duration of the extraction and the temperature at which it is conducted.

Losses of yields may arise from:

1. Insufficient leaching of the raw material and its too sudden coagulation with water or other solutions causing the cells to be covered with coagulated albumen and inhibiting solution or modification of their contents.

2. The precipitation of certain inorganic salts (carrying also — mechanically — valuable organic material in small amounts), especially at the later stages of concentration. This precipitation depends, to a large extent, upon the hanging time, the phosphates being more soluble in the enhanced acid content of the solution obtained by the hanging of the meat.

3. Mechanical loss during manufacture.

4. The undue cooling of the solutions during manufacture.

This is particularly dangerous, especially when concentrating under a high vacuum. Bacterial spores possessing a high thermal death-point appear to be very common in meat factories. They tend to thrive within the limits of the temperatures encountered in connection with the accidental cooling of solutions or soups. Creatine and creatinine, two substances of great significance contained in extracts of meat, are particularly subject to complete decomposition in the presence of certain micro-organisms even when incipient putrefaction has not set in.

Undue hanging of the meat, that is past the maximum point of acid formation and when ammonia has begun to manifest itself analytically, involves the loss of creatine and creatinine, but the loss of these substances in the soups is much greater and should be the subject of constant supervision and control.

5. The volatilisation in the form of ammonia of part of the nitrogenous products. This arises from the prolonged treatment of the soups during evaporation. It amounts to an irreducible minimum of about 5 per cent. of the total solids, but may amount to as much as 20 per cent. as a result of injudicious treatment. As a general rule, it may be taken that in the dilute stage of the soups there is much more likelihood of loss from this cause. As the soups become more concentrated there is a marked inhibition of decomposition.

Hanging of Meat.

The hanging of meat has such an obvious influence upon the nature of an extract that a full investigation was considered justifiable at one time during the course of the author's experience under works' conditions.

Two series of experiments were made. The first series was a comparison between perfectly extracted, newly killed beef and beef from the same animal after hanging for two days. Pure water was used in the extraction.

The second series was the extraction with water containing 0·5 per cent. sodium chloride of (*a*) fresh beef, (*b*) beef hung two days, and (*c*) beef hung four days.

Table A. gives the analysis of the extracts in percentages of the original beef.

TABLE A.

	1ST SERIES. *Extraction without Salt.*		2ND SERIES. *Extraction with 0·5 Per Cent. Salt.*		
	Fresh Beef.	*Beef Hung 2 Days.*	*Fresh Beef.*	*Beef Hung 2 Days.*	*Beef Hung 4 Days.*
In Beef.					
Moisture	74·53	75·70	75·70	75·42	75·45
Fat	3·04	2·14	2·21	2·21	2·61
In Extract.					
Total solids	5·430	4·090	4·150	4·710	4·640
Sodium chloride	0·073	0·072	0·580	0·560	0·560
Ash	1·094	1·068	1·500	1·540	1·490
Phosphoric acid	0·380	0·390	0·380	0·400	0·390
Total nitrogen	0·442	0·445	0·419	0·460	0·480
Albumoses and gelatine	0·284	0·232	0·170	0·330	0·320
Peptone-like bodies	0·730	0·980	0·700	0·790	0·940
Meat bases, etc.	0·870	0·870	0·870	0·800	0·880
Creatinine	0·250	0·254	0·205	0·295	0·250
Creatine ...	0·116	0·144	0·173	0·098	0·078
Lactic acid ...	0·710	0·970	0·760	1·100	1·020

Table B. gives the figures contained in Table A. converted into percentages of moisture-free beef without fat.

TABLE B.

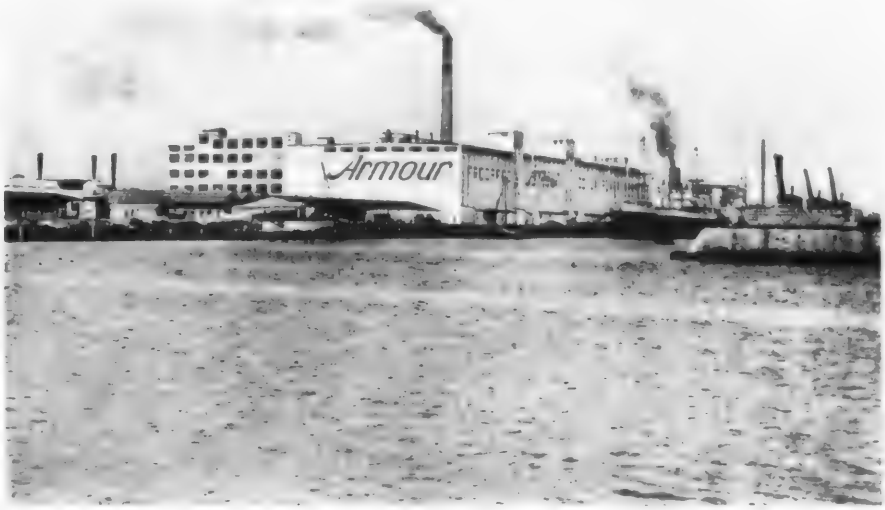
	1ST SERIES. *Extraction without Salt.*		2ND SERIES. *Extraction with 0·5 Per Cent. Salt.*		
	Fresh Beef.	*Beef Hung 2 Days.*	*Fresh Beef.*	*Beef Hung 2 Days.*	*Beef Hung 4 Days.*
Total solids	15·71	18·54	18·79	21·05	21·15
Sodium chloride	0·33	0·33	2·63	2·50	2·55
Ash	5·01	4·84	6·79	6·88	6·79
Phosphoric acid	1·74	1·77	1·72	1·79	1·78
Total nitrogen ..	2·02	2·02	1·90	2·06	2·19
Albumoses and gelatine	1·30	1·05	0·77	1·47	1·46
Peptone-like bodies	3·34	4·44	3·17	3·53	4·28
Meat bases and ammonia	3·99	3·96	3·94	3·84	4·01
Creatinine	1·19	1·15	0·93	1·32	1·18
Creatine	0·53	0·65	0·78	0·44	0·36
Lactic acid	3·20	4·30	3·40	4·00	4·60

For the moment comment on the above table will be restricted to pointing out the increase in peptone-like bodies and also of lactic acid. The differences appear small, owing to the small percentage extracted from beef, but in the next table these differences will be shown in actual extract.

Table C. gives the analyses in Table B. converted to extract of beef with 20 per cent. moisture.

TABLE C.

	1ST SERIES. *Extraction without Salt.*		2ND SERIES. *Extraction with 0·5 Per Cent. Salt.*		
	Fresh Beef.	*Beef Hung 2 Days.*	*Fresh Beef.*	*Beef Hung 2 Days.*	*Beef Hung 4 Days.*
Extract at 20 per cent. moisture. Percentage dry fat-free beef having the following analysis:	19·63	23·17	20·20	23·20	23·25
Salt (NaCl) ...	1·68	1·42	13·02	10·77	10·97
Total solids less salt	78·30	78·59	80·00	79·96	80·00
Ash	25·52	20·89	33·61	29·65	29·20
Phosphoric acid	8·86	7·64	8·51	7·71	7·66
Albumoses, etc.	6·62	4·53	3·81	6·34	6·28
Peptone-like bodies ...	17·01	19·16	15·69	15·11	18·41
Meat bases, etc.	20·32	17·09	19·50	16·55	17·25
Creatinine	6·06	4·96	4·60	5·69	5·08
Creatine	2·70	2·81	3·86	1·90	1·55
Lactic acid	16·30	19·00	16·80	21·12	19·78



Messrs. Armour's La Plata Works.

With reference to yields, it will be seen that there is a very considerable increase in yield of extract from beef hung for two days (at ordinary temperature).

There is a great difference between the behaviour and appearance of soups made from fresh and hung meat. From fresh meat the soups are light, turbid, and difficult to filter, and deposit a flocculent precipitate after slight concentration.

The organic insoluble matter from those extracts made from hung beef is much less than those from fresh beef, even when filtered at a stage when the total solids have reached 50 per cent.

The conclusion to be drawn from the above data is that the hanging of beef, during a period (varying according to temperature and other atmospheric conditions) which allows ripening to proceed to its fullest extent, without the intervention of bacterial action, is advisable from the point of view of extract meat manufacture.

The dilute soups are usually evaporated under vacuum to the "strong stage" after filtration. The strong soups containing about 50 per cent. total solids are again filtered. From the strong stage there exists much difference of opinion regarding the best mode of finishing. Some manufacturers pin their faith on vacuum finishing—others favour a drastic finishing. It all depends upon the type of extract which is aimed at.

The Evaluation of Extracts.

One of the first considerations is the retention of the delicate aroma characteristic of a carefully prepared extract. To one accustomed to constant tasting of extracts, there is little difficulty in detecting a carelessly prepared product, even if, as is invariably the case with reputable brands, it has been made with the best of raw materials.

There is not a large volume of literature relating to the judging of extracts. In May, 1915, there assembled a joint meeting of the Society of Public Analysts and the Biochemical Society to discuss "methods adopted in the estimation of nitrogenous constituents of extracts derived from albuminous substances such as Meat Extracts, with special reference to the interpretation of results." The result of the discussion was not particularly informative to the analyst who wished to report fully upon an extract in all its bearings. It appeared that the fault lay, not with the analyst and his methods and their various shortcomings, but in the lack of definition of what a meat extract is. Presumably it is pure meat extracted with water and evaporated to pasty consistency. But what is "pure meat"?

From the point of view of the analyst not intimately concerned with extract manufacture, the aim is to detect adulteration. It has been long known that yeast extracts and mixtures of yeast and meat extracts might be differentiated from pure meat extracts by their content of creatine and creatinine, but it was only in 1904 that a more or less satisfactory method for their analysis was employed—viz., that of Folin.

Creatine and Creatinine.

It has become to be fairly generally admitted that the percentage of creatinine and creatine forms the best criterion of the quality of a meat extract. *Reductio ad absurdum*, it is obvious that creatinine and creatine might be added to, say, molasses, but this would not make molasses a meat extract, notwithstanding that it contain the requisite percentage

of those bodies and the same proportion of phosphoric acid! But, given other attributes common to all meat extracts (these will be specified later on), it is obvious that in extracting a substance containing a constituent of more or less constant percentage (as does muscular tissue), save for the loss of this constituent without corresponding diminution of those constituents with which it is associated, the final percentage of such extract is directly proportional to the amount of the original substance from which it is derived. If some of the constituent, say creatinine and creatine, gets lost during manipulation subsequent to extraction, the implication of the figure for creatine and creatinine obtained by analysis is misleading, as the proportion of meat used, derived from this figure, would be found to be less than that actually used, but even here a consideration of the concomitant decompositions (of substances other than those mentioned) which must necessarily occur may tend even to accentuate the significance of the figures for creatine and creatinine. In other words, a loss of creatine and creatinine in manufacture is indicative of undesirable decomposition.

Meat Works at La Blanca.

At the joint meeting already mentioned, Professor Hopkins said that while he greatly admired the ingenuity which had been displayed in elaborating methods for the evaluation of such complicated substances as extracts, and while there was no doubt that such methods enabled one to say whether a given article was what it pretended to be, and to compare one product with another, he would like to emphasise the fact that the question of what particular factor (for meat bases) was used was of very little importance, because the food value was not estimated in any strict sense and, in fact, nothing was really known about the food value of such sub entirely undetermined, so that nothing could be said about their "food value" in so far as this meant their value as "food."

Professor Hopkins omitted to mention creatinine as a constituent of extracts. It depends upon the preparation of an extract whether the creatine is converted into creatinine in greater or less quantity. In extracts having received protracted evaporation the tendency is to convert more and more creatine into creatinine. Whatever may have been the truth regarding the effect of creatine in the animal body, it is known that "creatinine given by the mouth is rapidly and almost quantitatively excreted in the urine as such." Thus it appears that while creatine is assimilated in some measure, creatinine is not. And, according to the subsequent manipulation suffered by a solution obtained by extracting raw meat, so its dietetic or medicinal properties are altered.

TOMATO JUICE

A note on the American situation, together with a review of Dr. Kohman's studies.

THERE IS no Marking Order under the Merchandise Marks Act requiring the use of a mark of origin on foreign tomato pulp sold in the form of canned tomatoes, canned soups, and ketchups. The complaint has been that manufacturers here are unable to secure the home or Empire commodity in sufficient quantities to meet their requirements. It is reported, however, that the British growers are co-operating with leading manufacturers to bring about a large increase in the output of such products made from guaranteed home-grown fruit. The same thing is happening in Canada.

Questions asked in the House of Commons recently concerning the sale of foreign tomato pulp in the form of ketchups and canned products under labels which suggest that they are British goods, have created widespread interest, and as a result of a further question asked by Captain G. S. H. Watt on February 22, Sir John Gilmour, the Minister of Agriculture, intimated that foreign tomato pulp will be covered by the provisions of the Import Duties Bill.

Mr. Malcolm MacDonald, Under-Secretary for the Dominions, also replying to Captain Watt, said that imports into the United Kingdom of tomatoes preserved by canning or bottling, consigned from Canada, had increased from 722 cwts. in 1927 to 5,966 cwts. in 1931, while, according to the figures of Canadian exports published by the Dominion Bureau of Statistics, the value of exports of sauces, pickles, and ketchups to the United Kingdom increased from 549,117 dollars in the year ended March 31, 1927, to 1,346,262 dollars in the year ended March 31, 1931. These goods consisted almost entirely of tomato ketchup.

Tomato Juice

In U.S.A. the output of tomato products has grown rapidly. Thus the canning of tomato juice has increased in two years from a negligible amount to 108,701 cases in 1929 and 739,148 cases in 1930. This amazing leap into popular favour has, no doubt, been largely accomplished as a result of the widespread publicity given to the "vitamin story"; tomato juice is rich in vitamins A, B, and C, and there has arisen a horde of "juice faddists" who have not been without influence on the general public.

Vitamins.

Orange juice has long been recommended as the best source of vitamin C to supplement milk in infant feeding. Now we are told that tomato juice is better. Thus Professor Sherman of Columbia University has drawn up the following comparison:

Vitamin A.	
Orange juice	350
Tomatoes raw or canned	2,700
Vitamin B.	
Orange juice	"about" 150
Tomatoes, raw or canned	130-250
Vitamin C.	
Orange juice	150-300
Tomatoes, raw or canned	150-300

Similarly, Dr. William Weston gives the following table comparing the relative mineral contents of oranges and tomatoes:

	Iron.	*Manganese.*	*Copper.*
Oranges ...	70·5	7·6	4·75
Tomatoes ...	160·0	26·7	15·3

Dr. E. F. Kohman and his colleagues at the research laboratories of the National Canners' Association have made extensive studies of the vitamin content of tomatoes and tomato products, and an account of their work has been published. Previous findings by others that vine ripened tomatoes are superior to artificially ripened tomatoes and that canned whole tomatoes retain practically their full vitamin content are confirmed. It is pointed out that the vitamin A content of tomatoes is practically unaffected by the commercial processes to which tomatoes and tomato products are commonly subjected, but that it is largely removed with the pulp by filtering.

The vitamin B content of tomatoes is apparently only affected by certain processes where excessive exposure to oxygen is not avoided.

According to Dr. Kohman's findings, vitamin C in tomatoes is apparently quite stable to heat if oxida-

tion is avoided. Any process that introduces air will result in destruction of vitamin C in proportion to the exposure to oxygen and the temperature to which the product is subsequently heated while oxygen is present. Bringing cold processed cyclone juice to boiling destroys a part of the vitamin C. In Dr. Kohman's experiments this amounted to about one-half the vitamin C present. Subsequent concentration of the cyclone juice to two-fifths its volume by open-kettle boiling or to one-fifth its volume in vacuum requiring continuous, long heating apparently causes no further vitamin C destruction. The preliminary destruction before the boiling point is reached is due to oxidation by air incorporated by the cyclone. Vigorous boiling removes all air in a very short time.

No device, so far available, will extract the juice from whole tomatoes without incorporating more or less air. As tomatoes enter any hopper or opening to any juicing equipment, more or less air is entrapped. The viscous nature of the mascerated tomato and the colloidal properties of the juice will hold entrapped air with a tenacity that will not permit it to escape except under a vacuum or by heating. The latter causes vitamin C destruction.

Even though no air is entrapped, tomatoes normally contain some oxygen. The question may arise in many people's minds as to why the oxygen naturally present does not cause destruction of vitamin C in a sound whole tomato, inasmuch as it is so susceptible to oxidation. The answer is that vitamin C in its natural environment in the sound plant cell is relatively stable. It should be realised that every living plant cell contains enzymes which bring about chemical changes, such as oxidation and reduction. When the plant cells are ruptured, as is the case in expressing the juice, the enzymes become particularly active, and apparently one of the reactions which takes place is the oxidation of vitamin C, which in the sound plant cell is relatively stable. After a tomato is mascerated and the juice extracted, the oxygen that was without effect in the sound, unbroken tomato cell may result in entirely different consequences. Wildman has shown that marked chemical changes are in evidence within 6 to 10 minutes after mascerating tomatoes.

Since it is difficult or even impossible to extract the juice from tomatoes without incorporating some oxygen, and since heating this juice to eliminate the oxygen will cause destruction of vitamin C, it is obvious that some other method must be employed. The only alternative at present known is a vacuum applied to the juice. Since the raw juice of fruits and vegetables, even though no air was incorporated beyond that normally in the cells, still undergoes relatively rapid changes, Dr. Kohman urges that tomato juice must be promptly handled and canned or bottled and sterilised, not alone to destroy micro-organisms, but to destroy the enzymic processes which bring about rapid changes without any growth of bacteria or similar micro-organisms, and this necessitates a system in which the tomato—within a few moments, or at least within a few minutes—is converted into juice and the juice sealed in a container and subjected to the pasteurising or sterilising process.

Dr. Kohman suggests a process in which the tomato juice immediately upon leaving the extractor is subjected to sufficiently high vacuum to remove all the air. In order to be fully effective, this vacuum should be sufficient to cause the liquid to boil, otherwise the air in solution is not completely removed. If the tomatoes are somewhat warmed during the extraction process, any incorporated air will be the more easily removed in the vacuum. If the elevation in temperature is moderate, it is not likely that its effect will be noticeable within the few moments required to subject the juice to a vacuum. Since the heat applied to tomatoes in the canning of whole tomatoes does not destroy the vitamin C, and since no noticeable loss in vitamin C occurs during extensive boiling in the concentration of tomato pulp, although there is considerable loss in bringing it to boil, heating tomato juice for sterilisation after thorough removal of air should cause no appreciable loss of vitamin C. Because of the liquid nature of tomato juice, less heat application is necessary for sterilisation than is the case with canned whole tomatoes.

A brief outline of the usual method of canning tomato juice is as follows:

Manufacture.

In 1931 a standard for canned tomato juice was issued by the U.S.A. Federal authorities: "Canned tomato juice is the unconcentrated, pasteurised product, consisting of the liquid, with a substantial portion of the pulp, expressed from ripe tomatoes, with or without the application of heat; and with or without the addition of salt."

Sound tomatoes are well washed and carefully sorted and trimmed. They are steamed for 1 to 3 minutes on a continuous belt scalder, after which they are put through juice extraction machines designed to minimise the incorporation of air; usually the underlying principle involved is to press the material through a screen by means of beaters or rollers. With the least possible delay the juice is then preheated, during which salt is added in the proportion of about 4 to 6 lbs. per 100 gals. of juice. A preheating temperature of 180° F. is recommended, but 140° to 150° F. is commonly employed. The cans are filled to leave practically no head space after closure—an important point in relation to the colour and flavour of the product. As regards the sterilising temperature, L. F. Pratt recommends:

	When the Filling Temperature is 140° F.	*When the Filling Temperature is 180° F.*
No. 1 cans ...	15 mins. at 212° F.	5 mins. at 212° F.
No. 2 cans ...	20 ,, ,, ,,	10 ,, ,, ,,
No. 10 cans ...	30 ,, ,, ,,	20 ,, ,, ,,

One point about which it is necessary to make a note is the question of homogenisation of the juice. Homogenisation is sometimes employed in the case of juice put up in bottles with the object of overcoming the tendency to separate into clear and thick portions. It is, however, not necessary to homo-

(*Continued on next page.*)

VITAMIN EXCESS

IS THIS POSSIBLE?

To the Editor.

DEAR SIR,

It is, I think, unfortunate that three people spent an hour deciphering "a scrawl on yellow paper" from Mr. Robert Whymper if the sole result was to reveal the statements which are reproduced in your editorial on "Vitamin Excess" in the November issue.

I would be inclined to let the matter pass without comment—as I am not without suspicion that Mr. Whymper is indulging in a "leg pull"—were it not that you, sir, have taken him seriously, and have added the opinion that "real danger exists in being over-dosed with vitamins."

If Mr. Whymper really holds the view that "neither I nor the majority of people have ever suffered from vitamin deficiency," he must be almost alone in his ignorance of the results of the extensive nutritional studies which have been made in Western Europe and the United States during the past ten or fifteen years, and which clearly reveal that a very large proportion of the populations of our cities are actually to-day both qualitatively and quantitatively deficient in respect of vitamins.

I will not take up your space by giving examples, but I will ask Mr. Whymper to spend some hours of his travels reading through the recently published report of the Medical Research Council (No. 167, 1932). He will there be put in touch with an extensive literature which cannot fail to convince him of the magnitude of the misstatement he has made.

It is, however, your own comment to which I wish to draw attention, for it makes the definite and rather serious statement that excessive dosage with vitamins is dangerous.

The actual facts are that, of some nine substances grouped together as vitamins, only one is known to be responsible for harmful effects when given in large doses. Vitamin D plays some part in regulating the calcium content of the blood, and when given in excessive amounts the concentration of lime salts may rise to undesirably high levels. But it must be borne in mind that the dangerous dose is several thousand times that normally employed in treatment, and that the accurate methods used in standardising preparations of this vitamin make it as improbable that over-dosage will occur in the administration of this substance as in the use of any other medicinal substance.

As regards the other vitamins, it has been suggested that excess of vitamin A might be harmful. A long series of researches in my own laboratory has, however, failed to reveal any ill-effects resulting from the administration of relatively very large amounts of this food factor over long periods.

The "water-soluble" vitamin C and the B complex have never been associated with a "hypervitaminosis" in any experimental work which bore examination. In the *Veterinary Journal* for July, 1932, Blount, in discussing the etiology of fowl paralysis, advances the suggestion that one factor favouring the appearance of this condition is an excess of foods rich in vitamin B. Actually, the paper provides not the slightest shred of evidence in support of this view. No experimental work whatever is brought forward to show that administration of an excess of "vitamin B" will produce or favour the production of the condition, and the suggestion appears to rest solely on a selection of references from the literature which indicate either that a deficiency of vitamin B retards or that an excess accelerates tumour growth. Equally numerous references to papers which do not support this view are ignored.

May I be allowed to state my opinion that very great harm can be done by publishing statements for which there is little or no foundation in fact?

I am, sir,

Truly yours,

J. C. DRUMMOND.

UNIVERSITY OF LONDON.

November 14, 1932.

[We are glad to be corrected by so eminent an authority as Professor Drummond. What we had in mind was a warning issued by the German Government some two or three years ago against the indiscriminate irradiation of milk. We also had in mind the work of Dixon and Hoyle, on overdosage by irradiated ergosterol, and the discussion in American medical circles concerning the dangers of overdosage from the use of irradiated foods and medical products without adequate technical control of preparation. Professor Drummond, however, makes it clear that the likelihood of a condition of hypervitaminosis arising from the administration of vitaminised foods or other products prepared under properly controlled conditions is extremely remote.—EDITOR.]

TOMATO JUICE (*continued from previous page.*)

genise juice which is to be packed in cans. It should be remembered that if the juice is subjected to a homogenising process, less of the insoluble matter can be included, since an excess will result in too thick or heavy consistency, and a product more appropriate to be eaten with a spoon than to be used as a beverage results. By removing a certain portion of the tomato pulp or insoluble solids, a corresponding amount of the vitamin A is likewise removed, since the vitamin A is largely in the insoluble solids or pulp. It is worthy of serious consideration how far a process is to be employed which will tend to weaken an important selling point. The settling that occurs in a good tomato juice not homogenised is corrected by the shaking involved in opening the container. It is where this settling is in evidence before the container is opened that it is most objectionable.

HYDROGEN SWELLS

To the Editor.

DEAR SIR,

I was present at the conference at Birmingham on "Canned Goods for Hot Climates," and, not having taken notes, I am relying for details of the discussion upon the report contained in your valuable journal for November.

Obviously the occasion did not favour concentrated scientific discussion, and it is difficult to obtain a clear idea of the various implications.

With reference to the effect of plain and lacquered cans upon the incidence of hydrogen swells, it was said that, taking greengages as an example, they showed "after 23 weeks a loss of 80 per cent. with lacquered cans and 15 per cent. with plain cans."

On the following page you report Mr. Hirst as saying that the type of plate used does not matter so long as it is lacquered. Again, it was pointed out that there was an enormous difference between the results obtained by coke and charcoal plate.

Mr. Matthison offered to produce a laquer which would obviate the necessity of tinning the plate at all, despite the fact that plain cans were proven to be in certain cases infinitely better than lacquered cans.

In general, however, so far as one can piece together a large volume of conflicting evidence, the problem is one closely connected with tinplate. To evolve a new type of plate would appear to be at present in the realms of fantasy. So I venture to suggest that the most fruitful and probably the most expeditious line of research would be to seek for a harmless inhibitory substance.

Strong hints to the investigator are given by the mention of an unknown inhibitor of hydrogen formation and in the apparent inhibitory effect of the tin dissolved from the can.

Just as in the case of black marks in canned meats, where the necessary inhibitory substances were ascertained, so it seems that the solution to the problem of hydrogen swells may be found in this direction.

I remain,
Dear sir,
Yours faithfully,
T. CROSBIE WALSH.

LONDON.
November 11, 1932.

[It would be a good plan at future conferences to distribute advance copies of papers to be read, so as to give those attending a meeting an opportunity of preparing beforehand well-thought-out remarks and criticisms. This would largely obviate "scrappy" and vague discussions.—EDITOR.]

A Fruit Growing Area in South Africa.

ADULTERATION OF GRAPE WINE

IT has been a well-known practice to add apple and other fruit juices to grape wine, and the detection was very difficult until Werder in 1929 (*Ann. Falsif.*, vol. 22, p. 260) described a method which depended on the fact that sorbitol is present in Sorb fruits and in nearly all Rosaceæ fruits, but not in grapes. This substance combines with two volumes of benzaldehyde to form the insoluble amorphous white compound dibenzal sorbitol, and on this reaction Werder based his test, which would indicate definitely a 10 per cent. addition of fruit juices.

Recently Litterscheid (*Z. Unters. Lebensm.*, vol. 54, p. 576) has devised a new sorbite process for the detection of fruit wine in grape wine. The wine is pretreated in the same way as in Werder's method (boiling 100 c.c.s with 7 grams of animal charcoal and filtering hot). Then 100 c.c.s of the decolorised liquid are evaporated on the water bath to 4 to 5 c.c.s, and after cooling for 10 minutes the liquid portion is separated from the tartar by filtering through glass wool. The residue is washed and the total filtrate shaken with hydrochloric acid and a little orthochlorbenzaldehyde added. After 7 hours the condensation product, which separates in voluminous white flocks, is removed by filtration (but not washed) and the filtrate shaken with a further portion of the reagent, and any further precipitate is collected in the same filter. The precipitate is purified and derivatives made. The filtrate, from the second precipitation, is treated again with reagent, and any corresponding mannitol compound is obtained after prolonged standing. The sorbitol derivative is decomposed into its components by the action of 2 c.c.s warm hydrochloric acid, the excess of acid being driven off on the water bath. The residue is then converted into hexa acetyl sorbitol by warming with one drop of pyridine and 1 c.c. of acetic anhydride for one hour, after which it is poured into water. Methyl alcohol is added to the mixture until there is no further disappearance of the solid on shaking. The solution is allowed to crystallise and the acetyl derivative filtered off. Satisfactory results were obtained for 0·1 per cent. solution of mannitol or sorbitol, and for 2·5 to 10 per cent. by volume of decolorised apple wine in genuine white wine.

PIG BUSINESS

QUOTAS are now fashionable, and it looks as if the next will be for the bacon industry. At the Central Chamber of Agriculture some time ago Sir John Gilmour asked the pig producers to co-operate with the Government in devising a scheme which of necessity must entail some measure of control. He was emphatic on this point, and stated that although he was not enamoured of undue State interference with any industry he was conscious of the fact that they had certain treaty obligations of great moment to this country, and in order that they might meet those treaty restrictions it was essential that there should be a measure of control and co-operation on the part of the industry. In return for that the Government definitely pledged themselves, if that arrangement were reached, to give them the benefit of a quota, or a restriction of imports, in all pig products.

This will undoubtedly assist the industry, but the producers should pay more attention to the breeding of pigs suitable for bacon. Pig breeders are more interested in the rival breeds of pigs than in concentrating, as they do in Denmark and elsewhere, simply on the pig in best demand by the pork and bacon trades. Quite recently the Devonshire Grocers' Council protested against the Ministry of Agriculture subsidising the breeding of unsuitable pigs for bacon. This refers chiefly to the Large Blacks, because these produce bacon that is too fat.

Although the Pig Industry Council recommended the use of Large White boars, they also suggested the maintenance and improvement of pure strains of sows of other breeds for cross breeding with the Large Whites. The Ministry believes in the continued necessity for encouraging improvement in other breeds, and hence it is not prepared to restrict its grants entirely to any particular class. Still, the main object of pig breeding is for bacon production, and all efforts should be concentrated on breeding the pig which will produce the best bacon.

What's in a Name?

While we are on the subject of bacon, it is interesting to note that the Land Agents' Society is taking up the question of bacon designation. The Large Black Pig Society and other societies have frequently urged that the use of such terms as "Wiltshire" and "Ayrshire" should not be applied to foreign bacon. Naturally if one sees bacon in a shop labelled "Wiltshire" one imagines that it comes from Wiltshire. Those well versed in bacon manufacture know, however, that such names as "Wiltshire" or "Ayrshire" refer to a method of cure, not to producing districts. The Ministry of Agriculture, according to *The Times*, has undertaken to give careful consideration to the possibility of making a test case under the Merchandise Marks Act, provided the necessary evidence is furnished to the Department.

TRADE NOTES

Food Packages at the Canning Convention.

An interesting indication of the importance now attached to the proper packing of foodstuffs is given by the number of competitive classes for packages of various sorts which were included in the programme of the Imperial Fruit Show and Canners' Exhibition.

In the Canned Produce Section, Class No. 28 was for a non-returnable package for marketing 24 2½-size cans or 48 1-size cans. The first and second prizes (gold and silver medal diplomas) in this class went to the "Corrucase" made by the Thompson and Norris Manufacturing Co., Ltd. The sectional inset demonstrates how the cans are surrounded by shock-absorbing corrugations, and it is easy to see that the protection thus afforded to goods while in transit helps to ensure delivery in perfect condition and gives good stacking properties to the case.

Corrugated fibre-board cases of this type have been adopted by many of the leading firms of canners as the most suitable form of package for their canned goods.

This case was recently subjected to an exhaustive test against the old-fashioned wooden case and the result, it is said, proved conclusively that, in addition to the obvious advantages such as reduced freight costs, the corrugated fibre-board case, by reason of its resiliency, withstands rough usage to a far greater extent.

Third prize in this class was awarded to Eburite Corrugated Containers, Ltd.

* * *

In the United Kingdom Section of the Fruit Show also there were several classes for packings for apples and pears. Awards in these classes were secured by Eburite Corrugated Containers, Ltd., Messrs. Hugh Stevenson and Sons, Ltd., and the Thompson and Norris Manufacturing Co., Ltd.

* * *

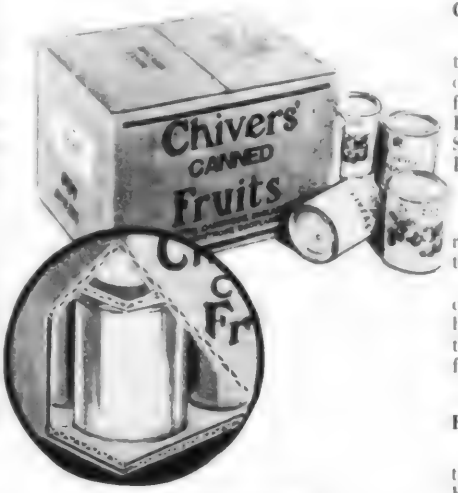
Hydraulic Machinery.

A variety of pressure pumps, hydraulic presses, accumulators, intensifiers, and testing machines are described in a booklet, "Hydraulic Machinery," issued by the well-known firm of Tangyes, Ltd., Birmingham.

The pressure pumps described are of several types and sizes, for pressures varying from 10 to 40 cwts. and 3 tons per square inch, while the presses include examples of those designed for such varied purposes as bookbinding, tobacco-baling, tinctures, and plastics moulding.

South Australian Food and Drug Regulations.

Revised food and drug regulations, becoming effective November 1, 1932, have been enacted in the State of South Australia under the Food and Drugs Act of 1908, according to an announcement in the South Australian Government Gazette. The regulations include general provisions covering requirements as to labelling of products, use of preservatives, flavourings, colouring, and artificial sweetening substances,



The "Corrucase."

and specific requirements for designated foods, drugs, soap, disinfectants, germicides, antiseptics, and deodorants.

* * *

One of the novelties at the recent Brewers' Exhibition was a display of aluminium casks for beer, chemicals, spirits, etc. These aluminium casks are made in all the usual capacities up to a hogshead. The aluminium from which they are made is said to be 99·6 per cent. pure and, therefore, not to contaminate nor be affected by the beer. In order to give the cask long life and strength it is encased in steel, thus ensuring immunity from all transport rough usage. The casks can be fitted according to customers' requirements, either for use with an extractor, in the case of lager beer, or ordinary tap hole and bush for draught and bottling purposes. Another point in favour of these casks is that, should the brewer desire, the beer can be pasteurised in the actual cask in which it is despatched to the consumer or bottler.

* * *

Trade Advisers to B.I.F.

Mr. R. Barlow, of the Metal Box Co., Ltd., Kingsway, and Mr. W. H Chivers, of Messrs. Chivers and Sons, Ltd., Histon, Cambridge, have been elected representatives of the foodstuffs section on the reconstituted exhibitors' advisory committee for the London section of the British Industries Fair, which has now been completed by the election of thirty members from those trade sections of the Fair in which there are upwards of twenty-five exhibitors.

* * *

Change of Address.

Premier Colloid Mills, Ltd., inform us that on the 26th ult. the registered offices of the company were transferred from Salisbury House to Brettenham House, Lancaster Place, Wellington St., W.C. 2, telephone number Temple Bar 5801.

* * *

Many interested spectators gathered round the Pexicon Company's stand at the Fruit Show.

The principal attraction was to see canned English and Empire jam fruits boiled into jam in about 5 minutes, by the use of "Pexicon," the fruit extract for jam making.

* * *

Powdered Coffee.

The advantages claimed for "Bantam" powdered coffee, not only as a beverage, but also as a coffee flavouring agent in such articles as ice-cream, etc., are pointed out in some leaflets issued by Bantam Products, Ltd. "Bantam" powdered coffee is said to be 100 per cent. water-soluble and to consist only of the soluble portion of the bean, the insoluble, woody matter being removed during manufacture without detriment to the flavour. The product is issued in hygienic, airtight containers, and is claimed to be of exceptionally good flavour, which is not removed during the freezing process in the case of coffee ice-cream.

* * *

Pyrometers of the thermo-couple (stem) type are described in a leaflet issued by the Foster Instrument Co. The instruments are of both the simple indicating and indicating-recording type and are produced in temperature ranges which cover practically all normal industrial requirements. The operating mechanisms are claimed to combine a high degree of accuracy with robustness

and ability to withstand industrial conditions.

* * *

A New Rotary Pump.

The Kitson rotary pump, which is marketed by Messrs. Bowmak and Co., Ltd., London, S.W. 1, is claimed to possess several features which make it of considerable interest. The pump contains only three moving parts and is said to have an efficiency equal to that of a good ram pump, with extra advantages in the way of low wear and low power consumption. The pumps can handle a wide range of viscosities, including semi-solids, and are made in sizes from 250 to 30,000 gallons per hour.

* * *

Scientific Food Packing.

"Food Packing Based on Scientific Principles" is the slogan chosen for an interesting illustrated booklet recently issued by Eburite Corrugated Containers, Ltd. The text and illustrations contained therein on the subject of the choice of the best packing for various food products will be of interest to all manufacturers faced with this problem.

* * *

Tin-plate Cleaning.

Can makers will be interested in a process sponsored by Cooper Phœnix, Ltd., to reduce the costs of tin-plate cleaning. In the ordinary way, miller's sharps or meal is used to absorb the oil on the tin-plate and when the meal has become saturated and can absorb no more oil it has to be discarded. Since the cost of the material is round about £6 per ton, it represents a definite item in manufacturing costs. Under the new process, the oil-soaked meal is cleaned, freed from oil, and rendered fit for re-use in a simple plant which uses a comparatively small amount of steam and water and some recoverable chemicals. By the use of this device, definite economies are said to be effected, and interested readers should get in touch with the manufacturers for further details.

* * *

An exceptionally comprehensive range of scientific control apparatus for the food industries is manufactured by Messrs. Short and Mason, Ltd. While making a special feature of temperature and temperature-time recording, indicating, and controlling devices, the firm also produces diaphragm valves, air-compressors, hygrometers and psychrometers, pressure gauges, gas leak indicators, barometers and anemometers, etc.

* * *

Lacquered Cans for Cherries.

Most visitors to the Canning Convention will remember the noteworthy display of canned cherries on the stand of Messrs. R. Ingham Clark and Co. The cherries had been packed, as a matter of fact, for the Convention at Manchester last year. They were in No. 2 cans, double coated with Orchaline, and a number of the cans which had been left over from the Manchester display were discovered in Messrs. Ingham Clark's factory just before the Birmingham show. When opened, the fruit, lacquer, and interior of the cans were all in exceptionally good condition, even after the prolonged storage—a fact which speaks well for the lacquer used, as cherries are notoriously prone to develop hydrogen swells and perforations.

* * *

Messrs. Skuse and Co., Ltd., the manufacturing chemists, have transferred their registered offices to 21-23, Eagle Street, W.C. 1. The firm's new telephone number is Holborn 9941 2 3, but the telegraphic address remains unaltered.

* * *

The Le Bas Steel Tube Co. have recently acquired a factory at Bedford to increase production of their well-known steel tubes for condenser and evaporator coils and other industrial uses.

* * *

The African Canning and Packing Corporation, Ltd., obtained first-class awards for their "Surf Maid" peaches and their "Gold Reef" pineapples.

* * *

About 200 of those who attended the Canners' Convention and Fruit Show at Birmingham had the interesting experience of being shown over the Perry Wood factory of the Metal Box Company. This modern can factory was opened a couple of years ago to specialise in the production of the open-top can, at the rate of 200,000,000 per annum, but, in order to be in advance of every possible demand, it has been built so that the lines can be increased at any time. Both the Perry Wood factory and the other factory at Acton, where open-tops are made, are having additions made to their equipment this winter, in order that the peak demand may be met more expeditiously next season.

The visitors were conducted in small groups to see every phase of the making of the open-top can by high-speed methods, from the slitting of the tin-plate to the testing of the completed can. The factory has 150,000 square feet of floor space, with storage room for 8,000,000 cans. As the visitors were concluding their inspection, H.R.H. the Prince of Wales arrived, and the visitors assembled to greet him. Mr. Robert Barlow, the managing director, presented to His Royal Highness Mr. F. N. Hepworth (chairman of the Metal Box Co.), Mr. R. J. Cox (sales manager), Mr. Scott Johnson (manager of the Perry Wood factory), Sir Edgar Jones, Mr. George Cadbury, Mr. W. B. Chivers, Mr. S. W. Smedley, Mr. G. C. Salmon, Mr. E. C. Boughton, Mr. F. Hirst, and Captain H. Leighton Davies.

Touring the factory, the Prince was greatly impressed by the size of the works and the speed and efficiency with which the cans are turned out—the rate is about 300 cans a minute per line—and the organisation and resources all dedicated to this end. Not unnaturally he remarked: "The worst of this job is that you are not employing enough people." Mr. Barlow explained that only the employment of automatic machinery to the greatest possible extent, under expert direction, could avail to turn out the cans in summer sufficiently quickly. At the end of his inspection the Prince was presented with a handsomely bound brochure, specially written for him, on the subject of cans and can-making.

This L.C. Engineering Supplies' Continuous Retort, shown above, has been installed for some time in a Wisbech cannery. We understand that exceptionally good results have been obtained.

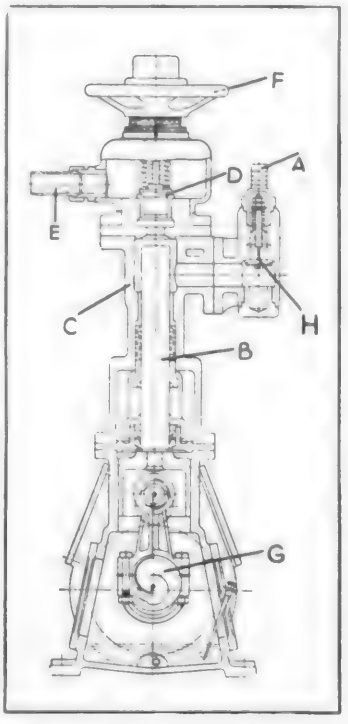
A NEW EMULSIFIER

THE other day we witnessed an interesting demonstration of a new type of emulsifier—the Impulsor emulsifier—developed by the Improved Emulsification Process Company, a subsidiary of Joseph Nathan and Co., Ltd. These Impulsor machines are now available for all commercial uses after a lengthy period of experimenting, during which all materials commonly subjected to emulsification have been successfully handled, and a valuable body of experience has thus been accumulated which should prove of great assistance in rendering technical service to those with special emulsification problems of their own.

The principles embodied in the design of the machine will be gathered from an examination of the accompanying diagram.

The Impulsor emulsifier consists of a cylinder (C) having two inlets (A) and an outlet head (D), within which a plunger (B) is made to reciprocate by means of a crank drive (G).

The two phases of the emulsion are fed from separate containers to the inlets of the machine, where the rate of flow of each is adjusted by control valves so that the correct proportions are obtained in the emulsion. The feed is assisted by the powerful suction from the machine itself. At the suction stroke of the plunger (B) a portion of the mixture is drawn into the cylinder through a non-return valve, which closes on the return stroke of the plunger. During this return (or compression) stroke, molecular aggregates are disintegrated by the increase in the rate of molecular bombardment. Pressure increases until it reaches a value predetermined by adjustment of the compression of the powerful outlet valve spring by means of the hand-wheel (F). When this pressure is attained the outlet valve (D) opens and a portion of the mixture is ejected at high velocity between the valve face and its seating.



The machine runs at 275 revolutions per minute, and the mixture within the cylinder is subjected to cycles of compression and expansion at a corresponding rate, and in consequence undergoes violent agitation. This treatment produces an intimate intermingling of the two phases, the oil or fat globules of which are further reduced to a very fine state of subdivision by the enormous shearing force to which the mixture is subject during ejection through the outer valve. The emulsion then flows through the exit port (E) to suitable receivers.

It is claimed that, by means of this new principle in the preparation of emulsions, an output of 100 gallons an hour of normal emulsion can be obtained on a machine driven by a 2¼-h.p. motor. The emulsions stand up to boiling, freezing, and treatment with hydrochloric acid, and they are in an exceedingly fine and uniform state of division. No premixing tanks or feed pump are required, the mixing and emulsifying being performed in the machine. The degree of dispersion is easily varied. The emulsifying and inlet heads are readily dismantled for cleaning. All parts in contact with liquid are made of stainless steel.

The Canners' Convention Party Visits the Works of Arthur Holden and Sons, Ltd.

ON the occasion of the Sixth Annual Canners' Convention at Birmingham a party paid a visit on October 28 to the works of Arthur Holden and Sons, Ltd., during which an inspection was made of the varnish and lacquer making departments. An interesting display of fossil and artificial gums used in lacquer making was explained by Mr. Holden and Mr. Pope. The oil boiling processes were then discussed by Mr. Briggs. The chief oils used are wood and linseed oils, which are boiled for two to six days at 250° to 580° F. The visitors were shown the range of oil boiling pots with capacities of 200 to 600 gallons. Mr. Matthison, in No. 1 pale varnish making shop, demonstrated how the gums are fused and the method of amalgamating oils with the "melt," how diluents are added and the method of pumping the varnish into storage tanks. An inspection of the finished stock rooms and of the extensive and well-equipped test and research departments followed. Altogether the visit proved to be one of remarkable interest, and great credit is due to the firm for the enthusiastic and progressive spirit which characterises every activity in which they are engaged.

INFORMATION and ADVICE

BISCUITS—TOMATO SAUCE—CACAO BUTTER SUBSTITUTE—ANGELICA—TABLE JELLIES—PASSION FRUIT—"BITTERS" IN MARMALADE—PRICKING WALNUTS—HOP BITTERS—ACID CALCIUM PHOSPHATE—MILK VENDING MACHINES—WATER FOR MEAT FACTORY—MOULD ON LEMON CURD

Biscuits.

953. *We should like to know whether any information is obtainable covering the manufacture of biscuits, such as petit beurre type. We use both soft and also hydrogenated fat, and so far cannot produce a hard biscuit, as usually found in this country. At present these biscuits turn out soft, suggesting mouldiness. We should appreciate any information whereby a firm biscuit can be made.* (London.)

It appears that you are trying to make your biscuits too short; actually petit beurre type are hard dough biscuits.

Below are given two recipes which might be used as a guide.

Mixing generally takes about thirty minutes, and after rolling it is best to let the dough lie for a period before taking to the machine.

If you keep approximately to the amounts of shortening and sugar per sack of flour given in the two recipes you will obtain a biscuit of the petit beurre hardness.

With regard to other additions—*e.g.*, flavour, milk powder, kind of shortening—you will, of course, have to form your own opinion, guided by palatability, cost, etc.

Petit Beurre Recipes.

Flour	280 lb.
Butter	33½ lb.
Lard	11 lb.
Icing sugar ...	75½ lb.
Milk (according to strength of flour)	5 to 6 gal.
Milk powder ...	8½ lb. in 5 to 6 gal. of water.
Salt	1 lb. 11 oz.
Soda	1 lb. 8 oz.
Ammonia ...	11 oz.
Cream of tartar	4 oz.
Tartaric acid ...	4 oz.

Flour	280 lb.
Cornflour	28 lb.
Margarine ...	30 lb.
Icing sugar ...	80½ lb.
Salt	2 lb.
Water (about) ...	5 gal.
Syrup	2 quarts.
Malt extract ...	1 lb. 6 oz.
Soda	2 lb.
Ammonia ...	6 oz.
Cream of tartar	4 oz.

954. *Kindly refer us to someone who could quote us for a plant for making pyrophosphate of soda.* (Glasgow.)

This was done

955. *Where can the machinery for making flaked oats, oatmeal, and other oat products be purchased?* (Ireland.)

Names of firms were given.

956. *Kindly refer us to a book on essences.* (Lancs.).

More information is required as to the nature of the essences.

957. *The Horticulture Section of the Ministry of Agriculture (Egypt) is extracting large quantities of citrate of lime, concentrated lime juice, etc., and wants to find large consumers. Can you be of any assistance?* (London.)

Suggestions were made.

958. *Will you kindly advise us the name and address of the manufacturers of "Autocrat" Tomato Paste, which we understand is put up in ¾ lb. tins?* (London.)

Probably some of our readers will know this.

Tomato Sauce.

959. *We should like to have a recipe for tomato sauce.* (France.)

The question is too vague to be answered usefully. As an example of a recipe, one might quote the following:

10 ten-lb. tins of tomato puree.
17½ lb. white sugar.
3½ lb. table salt.
4 lb. sago flour.
10 gal. water.
10 oz. 80 per cent. acetic acid.
2½ lb. raw onion, cut up.
½ lb. white pepper.
2 oz. cayenne.

Put all into pan and simmer gently for fifteen minutes. Bottle after passing through fine sieve, ten to the inch. Process in open tank at 180° for one hour, and 185° for a quarter of an hour. Bottle and cork hot.

960. *Kindly put us in touch with the maker of a machine for peeling onions.* (Ireland.)

This was done.

961. *Would you put us in touch with enquirers Nos. 845, 850, and 903?* (London.)

This was done.

962. *As we are interested in the canning of fresh and dried peas, we shall be obliged to you for submitting the name of a pea machinery manufacturer who might be able to furnish us with a small plant.* (Norway.)

Names were submitted.

963. *Kindly refer us to articles you have published on jam and marmalade making.* (Scotland.)

Articles on jam making appeared in the May issue and on marmalade in the November issue.

964. *We have received an enquiry for the names of United Kingdom manufacturers of complete plant for the production of macaroni. The plant is to include paste machine, drying room, flour mixing and kneading machine, vertical steam press, machines for making short and long macaroni, machines for making the Bologne type of fancy macaroni, and automatic weighing and packing machines. We should be glad to be put in touch with suitable manufacturers.* (London.)

This was done.

965. *Please let us have names of firms able to supply small filter plants, and also a solution or varnish suitable for applying to labels on bottles to prevent their becoming loose from damp.* (Derbyshire.)

Suitable recommendations were made.

Cacao Butter Substitute.

066. *Can you oblige us with a formula for making an edible fat to displace cacao-butter in cheap chocolates?* (England.)

We do not see how it is possible to give you a definite formula for edible fat to displace cacao-butter in cheap chocolates.

This is a matter which is best decided by carrying out tests with full knowledge of the particular circumstances which relate to the matter you have in hand.

Generally speaking, there are two classes of cacao-butter substitutes. One includes certain natural fats such as Illipé butter (Borneo tallow) and Shea butter. The second class comprises various mixtures of fats, such as hydrogenated oils and fats or mixtures of these with natural fats. Sometimes coconut oil and palm kernal stearines are used, but these are subject to rancidity on keeping, and would, of course, spoil any chocolate in which they were used.

On the whole, we should imagine that it would be best to use a mixture of hydrogenated oils and fats, but the particular choice of these will depend on so many things, such as types of fats and oils which you happen to have available for the purpose, the question of cost, and the particular type of chocolate being produced.

We would suggest that you secure the services of a chemist with practical experience of the subject.

Angelica.

067. *We would be glad to know if it is possible for you to send us a recipe for curing angelica.* (London.)

A description was given on page 208 of the July, 1931, issue. This is a process that cannot easily be carried out without the supervision of a man experienced in the work. A suitable person was recommended. A recipe alone is not of much use, unless one is prepared to devote much time and trouble to experimenting.

068. *Kindly put us in touch with the actual manufacturers of jelly bags.* (Gloucester.)

This was done.

069. *Please give us particulars of "Etox" and the name of the manufacturer.* (Plymouth.)

An article giving such information appeared in the June issue. The name of the manufacturer was given.

070. *We have an enquiry from South Africa for white crystalline paper, size 20 × 30 in., approximate weight 40 lb. per 1,000 sheets, and shall be obliged if you will put us in touch with the manufacturers of this class of paper.* (London.)

This was done.

Table Jellies.

071. *We should be glad if you would supply us with a recipe for making table jellies.* (London.)

This vague question begs a vague answer. We have dealt with this subject previously. The following are some general remarks on the subject.

It is customary to produce pint jelly tablets weighing about 5 oz.—this weight providing a reasonable amount of sugar for sweetening purposes—and since approximately 0·55 to 0·85 oz. of gelatin is required per tablet, it follows that the proportion of gelatin in the mixture must be in the neighbourhood of 11 per cent. In order to provide for good keeping qualities in the finished product, its water content should not much exceed 20 to 22 per cent., and the proportion of glucose or of invert sugar (or of both, if both be present) should approximate to 30 per cent.

These considerations lead to a mixing somewhat as follows:

Sugar	44	lb.
Glucose syrup	30	,,
Citric acid	¾	,,
Gelatin	11	,, (approx.)
Colour and essence		
Output, 100 lb.		

In this case the moisture in the finished jelly will be about 21 per cent.; the exact proportion of gelatin will be regulated by its strength as determined experimentally. The use of glucose is probably to be preferred to that of invert sugar, owing to the difficulty of regulating the amount of inversion within the comparatively narrow limits required for good keeping quality.

The process of manufacture depends to some extent upon whether the gelatin is used in sheet or powder form. If the former is used, it must be soaked in cold water until it becomes supple; the use of powdered gelatin avoids the necessity for prolonged soaking, but it is desirable to moisten the powder thoroughly and allow it to stand for a short time before adding to the sugar boil, since this facilitates solution.

In either case, the weight of dry gelatin will be, roughly, doubled by the absorption of water, and the height of the sugar-glocuse boil must be correspondingly regulated so as to give the correct output weight.

In the case of the recipe quoted, the sugar and glucose, together with sufficient water for solution (1½ to 2 gallons) should be boiled to about 245° F. to yield a syrup of some 77 lb. weight; this syrup is then transferred to a wheeled bogie or carrying pan, and the soaked gelatin added to it with gentle stirring to bring about solution of the gelatin.

When all of the latter is dissolved, it is a useful precaution to pass the mixture through a fine hair sieve into a second pan, so as to remove any foreign matter derived from the raw materials. Following this the acid, colour, and flavouring matter can be added and the whole thoroughly mixed but without any violent stirring.

072. *I should like to have the names of the best firms supplying machines for coffee roasting.* (Australia.)

These were forwarded.

073. *Please give the name of the manufacturer of Tinezol.* (London.)

This was furnished.

074. *The writer saw an exhibition on Broadway, New York, last year, of an automatic, electric doughnut-making machine. Could you put us in touch with the agents in London?* (Scotland.)

This was done.

075. *Who could supply fresh cutters for a small domestic-type mincing machine known as the "Gem Food Cutter"?* (London.)

Suggestions were made.

076. *Where can I obtain statistics of the total imports of cases of canned hams for the last three seasons into this country?* (Wales.)

Such a source was indicated.

Passion Fruit.

077. *What are the market prospects in the U.K. for passion fruit (grenadilla) pulp?* (Natal.)

We should imagine that there would be little, if any, response here. The proposition would not appear to be attractive even if backed up by an expensive publicity campaign. There is a little business done in canned passion fruit, chiefly among those who have made its acquaintance during residence abroad.

078. *Will you kindly refer us to information you have published on piping jellies?* (London.)

See issues for May, 1931, and February, 1932.

079. *We should be obliged if you could put us in touch with firms who could supply us at competitive rates with English pickled beef and flour (non-combine) for export to the West Indies.* (London.)

Suggestions were made.

080. *Please send me the name of a firm supplying agar-agar.* (Bournemouth.)

Names were furnished

081. *We shall be glad if you will be good enough to give us the names and addresses of suppliers of "Alcena" and synthetic albumen.*

We shall also be glad if you will put us in touch with suppliers of graduated enamel buckets or jugs of about three-gallon capacity. (South Africa.)

This information was supplied.

082. *Kindly give us the name of the firm marketing "Alcena."* (London.)

This was done.

"Bitters" in Marmalade.

083. *We have had an inquiry for "bitters" for marmalade and wonder if you could enlighten us as to what these consist of. Our customer informs us that these are added to ordinary oranges in making marmalade when Seville oranges are not obtainable.* (London.)

We think that there must be some confusion in the mind of your correspondent as to the meaning of the word "bitters." Apparently he must be referring to the bitter orange. The types of orange used for marmalade manufacture are Seville Sour, Malaga Bitter, Sicily Bitter, and Florida Bitter. Probably about 80 per cent. of the marmalade is made from the bitter orange. Of course, one could fortify the bitter taste by using oil or essence of the bitter orange.

The ordinary sweet orange is not suitable for marmalade manufacture, as it gives an opaque peel and the rest of the material is dull, although sweet orange dummies are sometimes used to a small extent in the manufacture of cheap marmalades.

Of late years the Seville Sour has been grafted on to Malaga Bitters, giving Malaga Sours which are also used in marmalade manufacture.

084. *Kindly supply information on the preparation of glacé cherries.* (London.)

See the article published in the September issue.

085. *Can you tell us what is the value of marrowfat peas in ½ and 1-lb. packets, the duty now levied on this article, and, if possible, the names of firms likely to be interested in the import of this line?* (Holland.)

The enquirer was referred to a reliable source for this information.

086. *We are told that there is a machine on the market for spraying white glaze on the outside of cooked meats, and we shall be glad if you will put us in touch with the manufacturer.* (Lancs.)

We do not know of a special machine for this purpose. The usual practice is dipping. The enquirer was referred to manufacturers of spraying machines.

087. [*A correspondent gave particulars of a household filter for the making of which he wished to have a quotation. This was passed on.*] (South Africa.)

088. *In reference to your August edition under the heading of "Information and Advice," page 248, para. 782, I should very much like to get in touch with this gentleman, as I am requiring a large quantity of chicken fat.* (London.)

This was arranged.

Pricking Walnuts.

089. *Will you please let us have particulars of the best method of pricking walnuts, and also particulars of any preparation which will remove walnut stains from the hands?* (Lancs.)

A steel fork is the best instrument to use, and one should use rubber gloves or rubber finger-tips.

In order to remove any stains, the best method to employ is hydrogen peroxide, or one might alternatively use lemon juice. Soda and soap should be avoided, as they only make matters worse.

090. *Kindly put me in touch with suppliers of Irish moss.* (London.)

This was done.

091. *Please recommend firms supplying adhesives suitable for labelling tins.* (London.)

Names were supplied.

092. *We wish to be put in touch with a firm able to supply hydrogenating plant.* (London.)

This was done.

093. *Please supply the name of the maker of the granulated rusk plant referred to in Enquiry No. 886 of the October issue.* (London.)

Names were furnished.

Hop Bitters.

094. *Kindly oblige with recipes and processing methods for hop bitters, hop ale, and stone ginger.* **(Wales.)**

Recipes and particulars of preparation of brewed ginger beer, draught fermented, and draught unfermented ginger beer are given in a book issued by W. J. Bush and Co., Ltd., and this should be consulted.

Recipes for hop bitters and a syrup for hop ale (non-alcoholic) are given below.

Hop Bitters (Brewed).

Refined sugar	25	lb.
Saccharin (550)	1	oz.
Sacchosoline	18	lb.
Finest Kent hops	8	lb.
Caramel (one star)	10	oz.
Essence for hop ale	10	oz.
Essence for ginger hop	5	oz.
Yeast	½ to 1	lb.
Citric or tartaric acid	1	lb.
Concentrated heading	4	oz.
Water to make	100	gal.

Syrup for Hop Ale (Non-Alcoholic).

Citric or tartaric acid	1½	oz.
Caramel (one star)	2	oz.
Soluble essence for hop ale	½	oz.
French cream	¼	oz.
Plain syrup to make	1	gal.

If required to be more bitter, use a very small quantity—say, 1 dram—of extract of bitters, previously dissolved in a little hot water.

095. *Kindly give names of makers and importers of milk powder and dried fruits.* (Midlands.)

Suggestions were made.

096. *Could you give us some addresses of English firms, producing conserved fresh potatoes for the steamer-lines, that could deliver us in spring—January, February, March—some waggons? Such potatoes are not produced in our country and the "Malta potatoes" won't do for our purposes.* (Germany.)

Suggestions were made.

097. *Could you kindly send us details of the most satisfactory method of curing and pickling fresh onions?* (London.)

We would first of all refer you to the answer to Enquiry No. 753, which appeared in the August issue, and if this does not meet your requirements we shall be glad to hear from you and to go further into the matter.

098. *Can you give us the name and address of the maker of the white glass jars similar to those now used for packing cheese?* (England.)

Names were supplied.

Acid Calcium Phosphate.

099. *Please give a working formula for the manufacture of acid calcium phosphate.* (London.)

It is really impossible to give you full particulars of the method of preparing this compound. Some information is obtainable from a book entitled *Phosphoric Acid, Phosphates, and Phosphatic Fertilisers*, by Waggaman.

The following description of the manufacture of acid calcium phosphate is perhaps typical of the average modern practice.

A batch of 500 lb. or more of hydrated lime or some other form of calcium is dumped into a mechanical mixing pan and sufficient phosphoric acid (50° to 55° Bé.) is added to convert practically all of the lime into the acid calcium phosphate. While it is desirable to obtain an acid salt with as high a neutralising strength as possible, care must be taken that no free phosphoric acid is present in the final product, as this will not only make it more difficult to dry but increase its tendency to deteriorate when mixed with sodium bicarbonate.

The reaction which takes place is both energetic and rapid and large quantities of water are evolved in the form of vapour.

The stirring is continued until the mass sets up. The material is then removed from the mixer and usually spread upon a floor for further drying and to ensure the completion of the reaction. This curing takes from 12 to 18 hours longer.

The lumps of acid phosphate, not larger than a hickory nut, are in turn fed to a steam-heated vacuum dryer where all but 1 per cent. of free moisture is driven off. The drying process must be very carefully conducted, since overheating will cause reversion of the mono and a loss in its neutralising strength.

After drying, the material is milled and separated into various grades (according to fineness) by means of a shaker or vibrating screen.

1,000. *Kindly supply a formula for making piccalilli.* (Wales.)

See article on this subject in the June issue.

1,001. *Could you let us have a list of the makers of fish and chip cooking ranges?* (Sheffield.)

Recommendations were made.

Milk Vending Machines.

1,002. *In a recent American publication I saw an illustration of an automatic milk vending machine in the form of a very large milk bottle. Upon inserting a coin in a slot a bottle of milk was produced, kept at a right temperature.*

Unfortunately the caption did not state whether that vending machine was made in Great Britain or by whom, though it stated that many shops in England are equipped with them.

Not being able to obtain any information regarding it from the local office of the British Trade Commissioner, in whose office I saw a copy of your publication, nor a suggestion how to go about it, I take the liberty of addressing you with a request to have it passed on to the manufacturer of this vending machine. (Canada.)

The enquirer was put in touch with the firm supplying these machines, although they are of the normal square type.

1,003. *We notice in the current issue of* FOOD MANUFACTURE, *under the heading of "Trade Notes," that the device for wrapping packages under the name of Easi-Fold has been issued by Mr. L. T. Lauder of Leeds, and we should be pleased if you could give us the full name and address of the person or firm who are marketing this device.* (Scotland.)

These were furnished.

1,004. *We are having difficulty in using up syrups left over after the manufacture of preserved ginger. Do you know of any publication we can purchase which will give us information on the methods of refining or use of discoloured syrups? It would not require to be of use for confectioners.* (New Zealand.)

We would suggest that this might be used in connection with the preparation of sweet pickle or sauce, the makers of which would probably be prepared to take it.

The other way is to avoid any waste of syrups in this connection by using a vacuum kettle and employing charcoal filter for decolorising purposes.

1,005. *Can you give us the name of the best book on fruit bottling and canning?* (Lancs.)

For the latter reference should be made to the *Food Industries Manual.*

A useful little book is *Domestic Preservation of Fruit and Vegetables* (price 1s.), which has a chapter on fruit bottling. This was issued under the auspices of the Campden Research Station.

Water for Meat Factory.

1,006. *We have the choice of two sources of water, one from the supply mains and the other from an artesian well. We submit analyses of the water from these sources and should be glad of your opinion as to which is the more suitable for the curing and cooking of meats.* (England.)

The softer the water the better, especially for brined meats which are to be packed in glass or tin containers. In the case of meats packed in glass the calcium and magnesium salts are liable to migrate to the surface of the meat or glass, giving an unsightly appearance.

Hard water is, of course, also unsuitable for boiler purposes.

In general calcium and magnesium salts present in the water supply serve no useful purpose and give rise to trouble and expense entailed in their removal by water softening methods or their precipitation in the course of processing or use in the boiler.

We would prefer to use the corporation supply, which has a permanent hardness of 3·1 degrees and a negligible temporary hardness as compared with the well water having a permanent hardness of 5·5 and a temporary hardness of 3·3.

1,007. *Kindly furnish names of firms manufacturing viscolisers in this country.* (London.)

This was done.

1,008. *Please give names of firms able to supply paper trimmings for packing.* (Lincs.)

These were given.

1,009. *I wish to buy some anchovy essence and should be glad to have names of firms able to supply this.* (Glos.)

Recommendations were made.

1,010. *Can you put me in touch with a manufacturer of dripping bags similar to the sample enclosed?* (Scotland.)

Suggestions were made.

1,011. *We notice in the November issue of* FOOD MANUFACTURE *a small paragraph on page 351 referring to an Easi-Fold device to facilitate the wrapping of bottles, jars, and other packages.*

We are rather interested in these transparent coverings, and should be extremely obliged if you would let us have the full postal address of L. T. Lauder of Leeds. (Lancs.)

This information was given.

Mould on Lemon Curd.

1,012. *We wish to obtain information respecting the cause of lemon curd becoming mouldy on the surface and also hardening on cooking. The mould usually appears about a fortnight after bottling.* (London.)

As we have previously pointed out (see page 97, April issue) the first essential is to take every reasonable precaution to avoid infection by mould spores and, consequently, it becomes a question of maintaining strictly hygienic conditions throughout every stage of processing and packing.

Another point is that pans, stirrers, jugs, jars, etc., should be perfectly dry. Avoid also the use of cold, unboiled water, as this may carry mould spores and thus prove a source of infection.

An additional precaution sometimes recommended is to wipe the rim of each jar, after filling, with a clean rag that has been dipped in glycerine. Fill at 180° to 200° F. and carefully protect from infection before putting on the paper circles, which may also have been dipped in glycerine and drained. Remember that one jar of mouldy lemon curd can infect others stored near it. Some advise adding 5 per cent. of glycerine to the curd when the latter is at 170° F. and just before finishing at 180° F.

New Companies

R. C. BARKER, LIMITED. (269382.) To take over the bus. of a butchers' and fishmongers' sundriesman, baker, and ice mnfr. cd. on at Ipswich. Nom. Cap.: £17,000 in £1 shares.

OXO (CANADA), LIMITED. (269967.) Thames House, Queen Street Place, E.C. To enter into an agmt. with Oxo, Ltd., and to carry on the bus. of food specialists, etc. Nom. Cap.: £10,000 in £1 shares.

LIGHTFOOTS (FISHMONGERS AND POULTERERS), LIMITED. (270001.) 7, Monument Street, E.C. 3. To carry on the bus. of fish and oyster mchts., poulterers, etc. Nom. Cap.: £2,000 in £1 shares.

ENDELLA, LIMITED. (270080.) To carry on the bus. of tea, coffee, and cocoa mchts., packers, and dlrs., etc. Nom. Cap.: £1,000 in £1 shares.

PERSONAL SCIENCE, LIMITED. (269555.) 1, Dover Street, Piccadilly, W. To carry on the bus. of mnfrs. and sellers of curative and health foods and producers of literature on health, etc. Nom. Cap.: £100 in £1 shares.

IDEAL CAKE AND CONFECTIONERY COMPANY, LIMITED. (269477.) Cumberland Avenue, Park Royal, N.W. To carry on the bus. of bakers, etc. Nom. Cap.: £100 in £1 shares.

HOLT EGG PACKERS, LIMITED. (269437.) To take over the bus. of an egg packing and grading station propr. cd. on at Holt, Norfolk, by D. J. Cook. Nom. Cap.: £2,000 in £1 shares.

E. LAUTEBACH AND SON, LIMITED. (269367.) To take over the bus. of mineral water mnfrs. cd. on at 28, Zetland St., Sunderland, by the exors. of Ernest Heinrich Lautebach. Nom. Cap.: £2,000 in £1 shares.

PENARTH CHOCOLATE COMPANY, LIMITED. (269416.) To carry on the bus. of confectioners, etc. Nom. Cap.: £2,500 in £1 shares.

R. WINTER, LIMITED. (269353.) To take over the retail section of the bus. of food specialists cd. on by Harvo, Ltd. (formerly R. Winter, Ltd.), at 257, Lawley St., Birmingham. Nom. Cap.: £10,000 in £1 shares.

NUTRITIOUS FOODS, LIMITED. (269352.) 7, Norfolk Street, Manchester. To carry on the bus. of mnfrs. of and dlrs. in artificial and natural foodstuffs, soups, flavourings, etc. Nom. Cap.: £100 in £1 shares.

POULTRY FARMERS DIRECT SUPPLY, LIMITED. (269968.) 41, Pitt Street, West Bromwich. To take over the bus. of a mnfr. of poultry and cattle meals cd. on by A. E. Gibbs. Nom. Cap.: £500 in £1 shares.

ARCHERS SUET, LIMITED. (269494.) To carry on the bus. of mnfrs. of and dlrs. in shredded suet, etc. Nom. Cap.: £5,000 in £1 shares.

CLANCAKES, LIMITED. (269337.) 69, Lincoln's Inn Fields, W.C. 2. To carry on the bus. of biscuit mnfrs., etc. Nom. Cap.: £500 in £1 shares.

DEESIDE DISTILLERIES, LIMITED. (269632.) To carry on the bus. of distillers of whisky, gin, etc. Nom. Cap.: £100 in £1 shares.

BARRETTS' IDEAL BAKERIES, LIMITED. (269568.) To carry on the bus. of bakers, etc. Nom. Cap.: £1,000 in £1 shares.

BOLEYN PACKING COMPANY, LIMITED. (269984.) 104, Plashet Road, Upton Park, E. To take over the bus. of a wholesale grocer and provision mcht. cd. on by R. Huntman. Nom. Cap.: £1,000 in £1 shares.

PURUS BAKERIES, LIMITED. (269969.) 261, Rookery Road, Handsworth, Birmingham. To take over the bus. cd. on at Birmingham at "Purus Bakeries." Nom. Cap.: £2,000 in £1 shares.

VICTORIA PARK CREAMERY, LIMITED. (269321.) To take over the bus. cd. on at Dorchester as the Victoria Park Creamery. Nom. Cap.: £500 in £1 shares.

UNIVERSAL FOOD SUPPLIES, LIMITED. (269320.) 12, Broad Court, Bow Street, W.C. 2. To provide boxes, stalls, and stands for the sale of potted meats, provisions, etc. Nom. Cap.: £1,000 in £1 shares.

UNITED CANNERS, LIMITED. (270045.) 6, Bishopsgate, E.C. 2. To carry on the bus. of mchts., packers, and canners of food products, preserved foods, etc. Nom. Cap.: £1,000 in 5s. shares.

PRIVATE COMPANIES

BELL BROTHERS (SELBY), LIMITED. (270029.) To take over the bus. of grocers and ham and bacon curers cd. on at 20, Gowthorpe, Selby, as Bell Brothers. Nom. Cap.: £500 in £1 shares.

MUNCH, LIMITED. (270039.) 272, Lumb Lane, Bradford. To take over the bus. cd. on at Bradford as Anglo-Canadian Bakeries. Nom. Cap.: £2,000 in £1 shares.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

Biochemistry in Industry

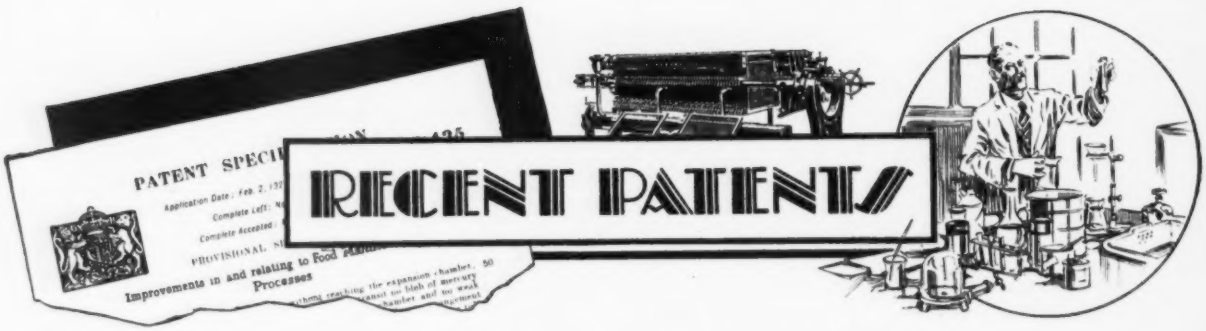
UNIVERSITY professors and works chemists have a characteristic habit of hiding themselves in their laboratories, quite oblivious, for the most part, to the outside world. In some respects it is an admirable trait to "mind one's own business"—at any rate, it shows that the chemist finds his subject wonderfully attractive. There is, however, at least one reason why it is necessary now and then to leave the rut, so that the professor type may see how the works type is getting on and *vice versa*. This is particularly desirable in the case of those concerned with biochemistry and those industries having a biochemical basis, for it is safe to say that the past few years have witnessed advances more rapid than those experienced by any other branch of science. It is therefore a useful achievement to have brought together the main facts of modern biochemical knowledge into the compass of a single, handy volume, and the credit for this is due to Professor A. T. Cameron, M.A., D.Sc., F.I.C.

The third edition of Cameron's *Textbook of Biochemistry* (published in 1931 by J. and A. Churchill) is undoubtedly the best of its kind. Biochemistry is an involved and difficult subject, but Professor Cameron is equal to the occasion, for his manner of exposition is interesting and lucid. The matter is well arranged, the printing is good, and the paper is excellent—and these are things that ease the path of the reader. Moreover, diagrams and tables are freely used to assist the task of clarifying intricate material.

We wish that every writer of serious books would follow Cameron's plan of devoting chapter one to a bird's-eye view of the subject under treatment. We would recommend that in every case the simplest and most elementary exposition possible be given of the ground covered by the book. It should, so to speak, paint the scene with a few bold and sweeping strokes on a broad stretch of canvas. The reader can then start out on his journey of exploration with a proper perspective of the country before him, and he will see how the different parts are related one to the other. Having obtained this comprehensive view, Prof. Cameron introduces us to the main facts of two basic, general subjects—enzymes and pH—and thence we proceed to the body of the treatise.

This is divided into six main sections: I. the foodstuffs, their derivatives and related compounds; II. the chemistry of digestion, the circulation, and the excreta; III. intermediate metabolism; IV. quantitative metabolism; V. immunology, the utilisation of biochemical processes in industry, and a biochemical introduction to pharmacology.

We feel certain that readers will find, as we have done, that this book is of inestimable value in familiarising oneself with the elements of modern biochemical knowledge.



These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents, and are published by permission of the Controller of H.M. Stationery Office, and the Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Latest Patent Applications

30428. CORNELIUS, T.: Devices for serving food, etc. Oct. 29.

30282. HAYWARD, L.: Apparatus for cooking waffles, etc. Oct. 28.

30399. ROWTON, H. S., ROWTON, J. L.: Machine for filleting fish. Oct. 29.

29205. LANGE, H. A. F.: Manufacture of cheese. Oct. 19.

28992. SIEMENS AND HALSKE AKT.-GES.: Method of removing salt from milk, etc. Oct. 17.

Specifications Published

382,360. MCDOWALL, STEVEN AND COMPANY, LIMITED, and CUNNINGHAM, P.: Domestic heating and cooking apparatus.

381,744. AESCHBACH AKT.-GES., F.: Meat-chopping machines

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts Published

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379,412. **Food preparations.** LINTON, F. A., 646, Pape Avenue, Toronto, Canada.

A granular cereal food product is obtained by mixing grains of wheat, rye, barley, oats, flax seed, and bran, pulverising the mixture, cooking it—*e.g.*, for 15 minutes at about 150° F.—in a steam-jacketed, closed receptacle with agitation and without addition of liquid, adding bone marrow and inorganic salts during the cooking, and finally drying in an oven—*e.g.*, at 150° F. An inorganic salt mixture which may be used includes sodium chloride, magnesium sulphate, monobasic sodium and calcium phosphates, dibasic potassium phosphate, calcium lactate, iron citrate, and a trace of iodine. The mixture of cereals, etc., may be irradiated with a quartz mercury vapour lamp, to produce vitamin D, prior to grinding. The flax seed may be added in ground condition. A small amount of steam may be introduced to moisten the material during cooking.

379,230. **Fish preparations.** OGURA, Z., 1981, Aso, Tobata-Shi, Fukuoka-Ken, Japan.

In separating fish by pressing into a liquid portion usable as a seasoning and a solid portion which may be used as an animal food, the fish is first heated to 40° to 70° C. for such a period of time as will cause only partial coagulation of the proteins and will not render the glue-forming constituents soluble. The liquid is freed from oil, which comes to the surface.

378,832. **Sugar.** TRAUBE, I., 29, Schlossstrasse, Charlottenburg, Berlin.

Sugar or substances containing sugar, such as beet pulp, beet slices, crushed sugar cane, raw juices, and molasses are refined by treating them in the presence of a lyophobic absorbent, such as active carbon with aluminium hydroxide gels of good absorbent properties and displaying isotropic properties in polarised light. The gels can be produced electrolytically by immersing two electrodes of pure aluminium in a solution containing not more than about 1 per cent. of a salt such as sodium or ammonium chloride and electrolysing with a current of 0·1 to 1 amp. per square dem. with adequate stirring. The gels can also be produced chemically by making a dilute aluminate solution from bauxite and precipitating by dilute solutions of acids. A temperature above 75° should not be used unless carbon dioxide is introduced during precipitation. Substances such as supercel and hyflocel, obtained by treating kieselguhr with acid, may be used along with the active carbon and gel. Examples are given of the purification of sugar juices and the removal of caramel from solutions.

Cream Viscosity

ACCORDING to Hening and Dahlberg (*Technical Bulletin*, No. 197), of the New York State Agricultural Experiment Station, cream from pasteurised milk which had been cooled to 40° F. over a surface tubular cooler, warmed to 80° F. over a surface tubular heater, and separated, increased in viscosity to a greater extent than cream handled in the usual way. This method is not easily adaptable to plant practice, due to the volume of milk to be treated.

Experiments applicable to plant practice showed that when cream at 40° F. or less was warmed to 80° to 84° F. in an internal tubular heater in three to ten minutes, and cooled to 40° to 48° F. in an internal tubular cooler in the same period in which it was warmed, very desirable increases in the viscosity of the cream could be obtained.

The time and temperature of warming and cooling were the important factors in obtaining and controlling the increased viscosity of the cream. Also, the temperature of the cream at the beginning of the treatment was an important factor. The slower the heating and cooling, the greater the increase in viscosity. Cooling to 48° to 50° F., then placing in a refrigerator at 40°, gave greater viscosity than cooling immediately to 40°.

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